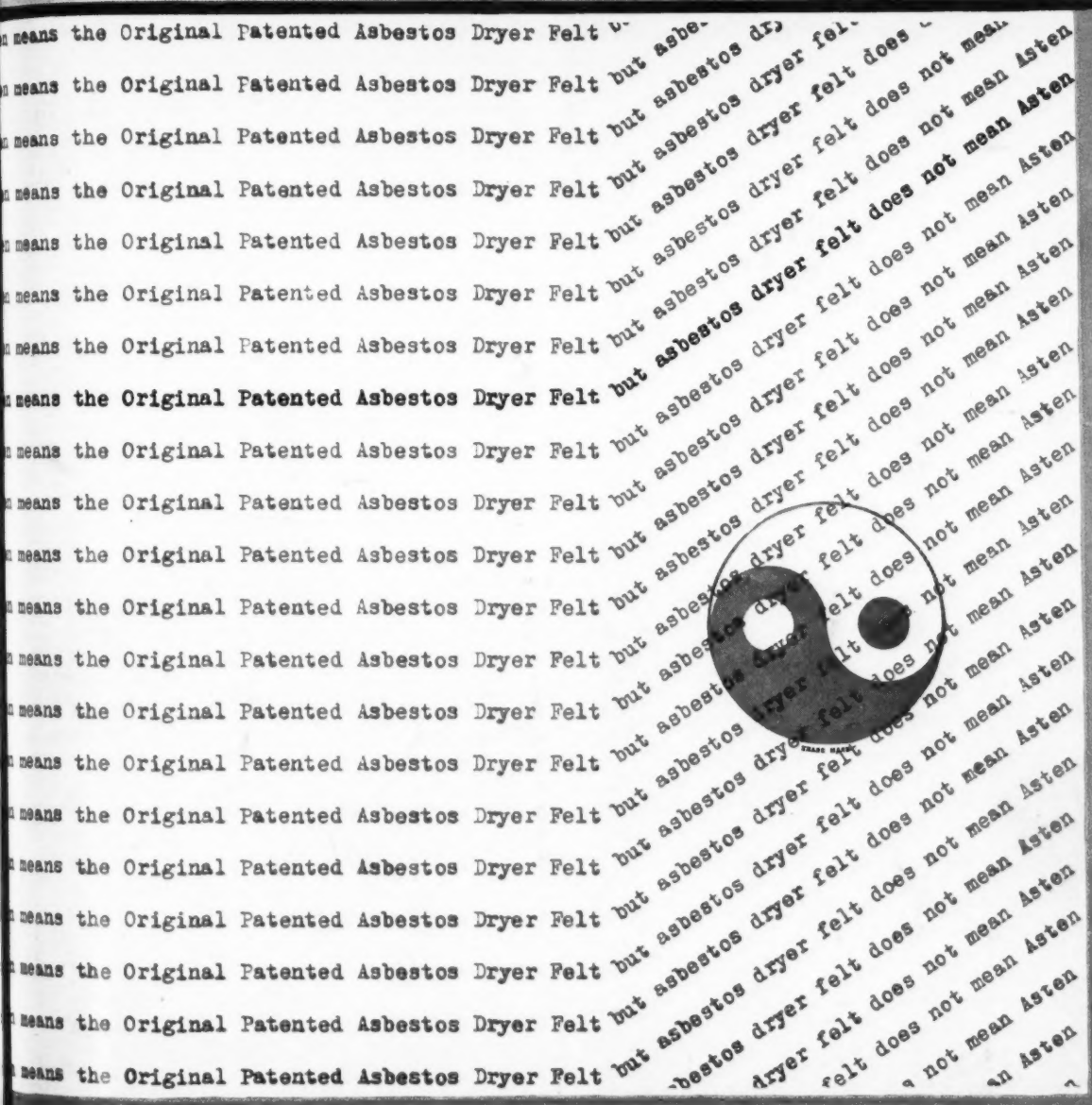
PAPER TRADE JOURNAL

THE INTERNATIONAL WEEKLY OF THE PAPER AND PULP INDUSTRY AND THE PIONEER PUBLICATION IN ITS FIELD

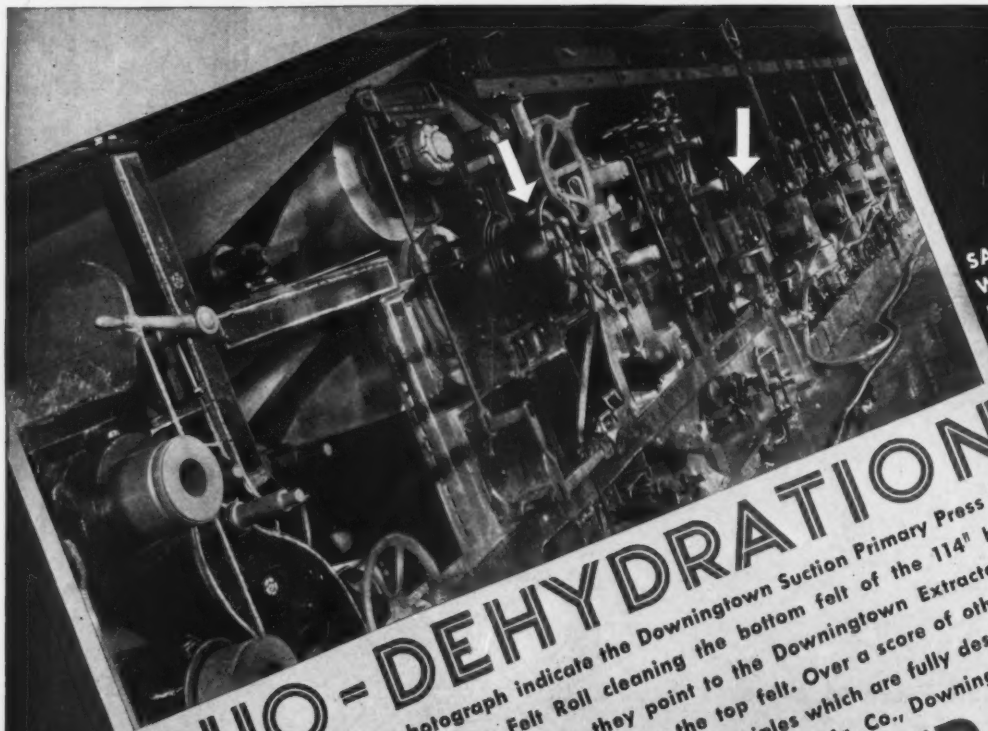


SEPT. 15 1938

Vol. CVII
No. 11

TAPPI FALL CONVENTION

DOWNINGTOWN



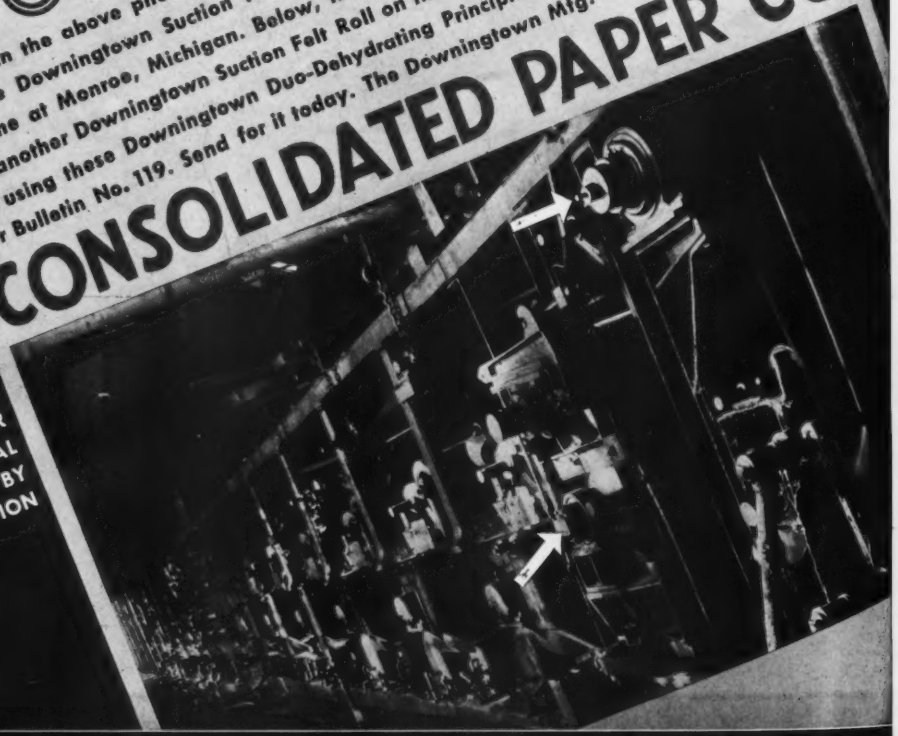
SAFE WATER REMOVAL BY EXTRACTION

DUO-DEHYDRATION

Arrows in the above photograph indicate the Downingtown Suction Primary Press Roll and the Downingtown Suction Felt Roll cleaning the bottom felt of the 114" board machine at Monroe, Michigan. Below, they point to the Downingtown Extractor Unit and another Downingtown Suction Felt Roll on the top felt. Over a score of other mills are using these Downingtown Duo-Dehydrating Principles which are fully described in our Bulletin No. 119. Send for it today. The Downingtown Mfg. Co., Downingtown, Pa.

CONSOLIDATED PAPER CO.

STRAIGHT LINE WATER REMOVAL BY SUCTION



No Board Machine is Modern *Without* DUO-DEHYDRATION

Entered as second class matter at the Post Office at East Stroudsburg, Pa., under the Act of Congress of March 3, 1879. Published every Thursday by the Lockwood Trade Journal Co., at 34 N. Crystal St., East Stroudsburg, Pa. Executive and Editorial office: 15 W. 47th St., New York, N. Y.
Domestic subscription U. S. and possessions, $4.00 per year.

PAPER TRADE JOURNAL

THE INTERNATIONAL WEEKLY OF THE PAPER AND PULP INDUSTRY AND THE PIONEER PUBLICATION IN ITS FIELD

Published Every Thursday by the
LOCKWOOD TRADE JOURNAL CO., Inc.

Executive and Editorial Offices: 15 West 47th Street, N. Y. C.
Western Rep.—H. K. Vinton, 123 W. Madison St., Chicago, Ill.

The Contents of this Publication are Copyrighted

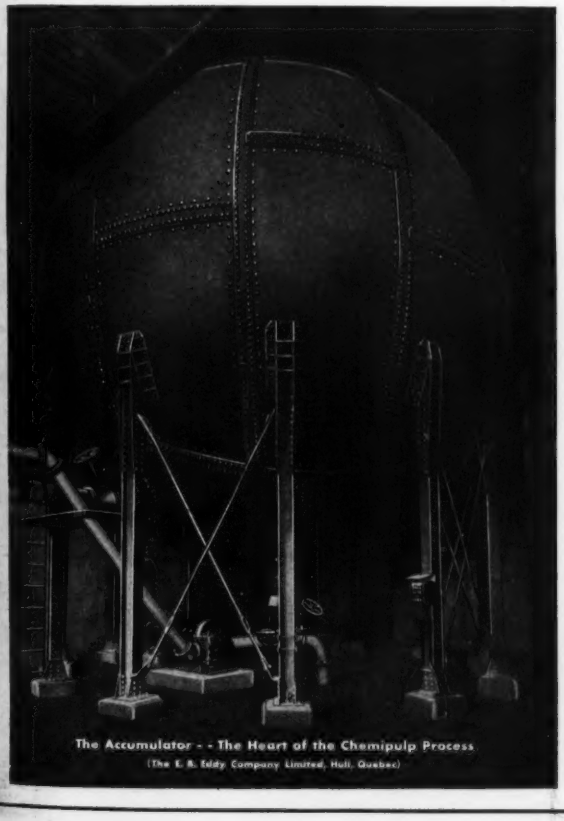
TABLE OF CONTENTS

Technical Association Meets at Green Bay .. 27
Canadian Mills May Set-up Production Soon 42
Increased Orders Buoys Up Chicago Market . 44
Donahue Gets Scripps-Howard Contract 46
News of the Philadelphia Market 48
Financial News of Pulp and Paper Industry . 50
Government Paper Bids and Awards 52
Valley Iron Works Announces Change 52
Collapsible Paper Tube 52
Obituary 55
To Present Aldine Award 55
Forthcoming Dard Hunter Book on Making of Paper by Hand in India 56
Sewage Pumps 58
A. C. Gilbert Receives Snell Estate 58
W. R. Barber Made Technical Director 60
National Sales Crusade in Boston 60
Lawrence Pump Issues Bulletin 60
Construction 62
Reserve Cars on the "Forty-Niner" 64
Monel Metal in Paper Mills 65

Editorial 66
Map of the Pulp and Paper Mills 67
Production Ratio Report 67
Technical Section
Economics of High Pressure Steam for Paper Mill Power Plants 69
Latest Development in Water Softening—Carbonaceous Zeolite 74
The Washing of Bleached Sulphite and the Introduction of a New Method for its Control 81
Steam Generation for Paper Mills 87
The Absorption of SO_3 in Water 93
Imports of Paper and Paper Stock 99
New York Market Review 102
Miscellaneous Markets 104
Market Quotations 106

The PAPER TRADE JOURNAL is indexed in Industrial Arts Index

Copyright, 1938, by the Lockwood Trade Journal Co., Inc.



The Accumulator - - The Heart of the Chemipulp Process
(The E. B. Eddy Company Limited, Hull, Quebec)

53 installations of the Chemipulp System are tangible evidence of acceptance by the manufacturers of sulphite pulp on the North American Continent. 11 different companies have placed 16 repeat orders for the System. An illustrated and descriptive folder may be had upon request.

CHEMIPULP PROCESS INC.

500 Woolworth Building, Watertown, New York
3311 First Avenue South, Seattle, Washington

CHEMIPULP PROCESS LIMITED, MONTRE[illegible]UEBEC

"NEW YORK CUSTOMERS CAN REACH OUR TRENTON OFFICES BY MERELY CALLING OUR NEW YORK NUMBER"

THE Crescent Insulated Wire and Cable Co. of Trenton, N. J., has no New York City office; yet any of the company's customers or agents in New York are connected at once with Trenton headquarters by calling a New York number. It's just like making a local call. The call goes direct to the switchboard in Crescent headquarters over a special Private Line Telephone circuit between New York and Trenton.

Thus Crescent functions almost as though it were located in the heart of the highly competitive New York market. The firm's selling agents and customers can discuss orders *personally*, as if the Crescent offices were just around the corner.

This Private Line Telephone Service was installed through a joint communication analysis by Crescent and telephone representatives. *Your* business may profit as well by similar Bell System special services. Why not ask your local telephone office to send a Bell System representative? He'll gladly help you size up your set-up.

PAPER TRADE JOURNAL

Reg. U. S. Pat. Off.

PAPER

SIXTY-SEVENTH YEAR

Established Feb. 17, 1899
Consolidated Nov. 16, 1899
with Paper Trade Journal.

Vol. CVII, No. 11 Thursday, September 15, 1938

Established Sept. 21, 1918
Consolidated Feb. 19, 1925
with Paper Trade Journal.

Technical Association Meets at Green Bay

Three Day Meeting Is Largely Attended and Is A Splendid Success In Every Respect — Frederic C. Clark, President of the Technical Association Presides — Interesting Papers Are Presented By Technical Men.

[FROM OUR SPECIAL CORRESPONDENT]

GREEN BAY, September 12, 1938.—Historic Green Bay, Wis., welcomed the Technical Association of the Pulp and Paper Industry in the delightful way that it promised. About 700 TAPPI members and guests were present at the three-day meeting of September 8-10, 1938. Those present were located for the most part at the Northland and Beaumont Hotels.

This convention was the first meeting of national scope held by the Technical Association in Green Bay. As in the past, the convention city combined the main desirable features of all TAPPI meetings, namely worthwhile technical paper presentations, opportunity to visit mills, good fellowship and beautiful scenic trips.

Capable Local Committee

As in all conventions the efficiency of the local planning committee is of prime importance in organizing and carrying through a meeting of this type. The association was indeed fortunate in having the voluntary services of those who served on the committee. Every member was outstandingly qualified to do the job to which he was assigned.

Since Green Bay is the home of the famous professional football team—the Packers, it can not but be noted that the committee acted together with the precision and effectiveness of a perfect team. Directing the efforts were A. B. Hansen, executive vice president of the Northern Paper Mills and W. J. Servotte, vice president of the Bay West Paper Company who were the general chairman and assistant general chairman respectively. As their immediate assistants were the three able vice chairmen of the Hoberg Paper Mills; E. A. Voigtman of Kimberly-Clark Corporation and Chairman of the TAPPI Lake States Section; and A. D. Murphy, manager of the Green Bay Association of Commerce.

Just as the above mentioned committeemen may be considered to be the "back field" of the team, the special subcommittee chairmen may be considered to be the "linesmen." These included P. M. Chiuminatto, secretary-treasurer; N. L. Malcove, arrangements; Frank Kerwin, transportation; John Maloney, entertainment; H. W. Sherman, golf and skeet; Don Fairbairn, publicity and printing; A. B. Hansen and J. M Conway, program; E. A. Voigtman, mill visits; R D. Cords, advertising and exhibits; A. K McNaughton, registration; and Mrs H. W. Gochnauer, ladies' program.

Finally as the coaches we have the Advisory Committee made up of the leading executives of the principal pulp and paper companies of that Lake States region.

First General Session

The meeting began with a technical session on Thursday morning. Frederic C. Clark, president of the Technical Association presided as chairman.

The first paper was presented by E. R. Whittemore, S. I. Aronovsky and D. F. J. Lynch of the U. S. Agricultural By-products Laboratory, Ames, Iowa, on "A New Conductivity Instrument and Method of Analyzing Kraft Liquors." Mr. Whittemore who presented the paper, said in part, "A simple rapid conductrometric apparatus for the analysis of pulping liquors and for general laboratory use has been developed. The ordinarily elaborate conductivity apparatus has been replaced with simple radio-type equipment using ordinary lighting current. The data are obtained by plotting the volume of titrating agent against the milliammeter readings taken at constant voltage.

Each constituent gives a line of characteristic slope and shape, and the junctions of these lines indicate the titration end points.

"Curves of typical titrations are given to illustrate the large variety of uses to which this method may be put. Conductivity curves of the inorganic constituents of kraft liquor both individually and in mixtures are shown. The results have been checked by the usual chemical analytical methods with good agreement. This method should prove useful both in control and research work because it affords a saving in time and chemicals. The apparatus involved is inexpensive and the procedure does not require extensive technical training on the part of the operator.

The next paper was "The Absorption of SO_2 in Water," by C. E. Reilly, Kimberly-Clark Corporation. Mr. Reilly said in part that the absorption of SO_2 in water in a tower packed with wood lattice grids has been studied in regard to the effect of gas velocity and liquor velocity, and temperature on the rate of gas absorption. Increasing gas velocity and

liquor velocity produce an increase in rate of absorption, the former being of greater importance at the higher liquor rates and the latter being of most importance at low liquor velocities, while an increase in temperature decreases the rate of absorption. Overall absorption co-efficient has been found to vary with the 1.42 power of liquor velocity and with the 1.26, 2.11, 2.17 and 2.26 power of gas velocity at liquor velocities of 1.49, 1.99, 2.48 and 2.98 ft./min. respectively. Results are presented in a form suitable for use in the design of absorption equipment.

Ray Riley of the Permutit Company gave a paper on the "Latest Development in Water Softening—Carbonaceous Zeolite" and stated that the sodium zeolites on the market which exchange their sodium base for calcium and magnesium (hardness) reduce this hardness to a minimum, but do not reduce total solids for alkalinity. The new carbonaceous zeolite (zeo-karb) described in this paper, retains the simplicity and complete hardness-removal characteristics of zeolite softeners and at the same time eliminates any form of alkalinity with (a) a corresponding reduction in total solids and CO_2 of steam, and (b) an increase in the sulphate-carbonate ratio. Thus, for the first time it is possible to remove sodium alkalinity often found in raw waters without resorting to evaporation.

Carbonaceous hydrogen zeolites are regenerated with dilute acid solutions in the same manner as a salt solution is used to regenerate sodium zeolites. A completely softened water of any desired alkalinity can be obtained by combining hydrogen and sodium zeolite effluents in correct proportions or by alkali neutralization of the hydrogen effluent. Case histories and typical results obtained in a number of commercial plants are given in detail.

The carbonaceous hydrogen zeolites are practically free of silica. They can also be regenerated with salt and function in the usual sodium zeolite cycle. The carbonaceous zeolite (zeo-karb) is gaining favor rapidly in the boiler feedwater field, because it is practically free of silica, avoiding any increase in silica content of the feedwater, of high exchange capacity and extremely resistant to low pH waters.

The following paper was given by title only because Mr. Prelinger was unable to be present. "The

R. G. MACDONALD, Secretary

Washing of Bleached Sulphite and its Control," by H. Prelinger, Crown-Zellerbach Corporation, Camas, Wash. Following is an abstract of this paper. The process of washing deals with two phenomena, adsorption and diffusion. The mechanism of adsorption is determined by three factors, namely: (1) The surface of the solid absorbent. (2) The concentration of the substance being absorbed in solution, and (3) The nature and characteristic of the absorbent and that of the substance being absorbed. Organic substances are more readily adsorbed and intimately retained by the fibers than are the electrolytes (inorganic salts).

Experimental work has shown that a low ash content of a pulp is not a criterion of good washing because of the various rates of diffusion of electrolytes and non-electrolytes.

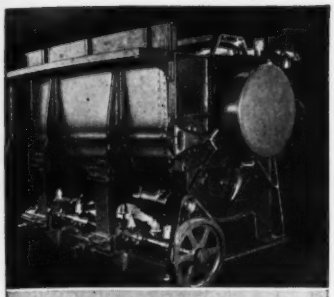
The second phenomenon in washing pulp is diffusion, which is initiated by soaking the pulp in water and is governed by these conditions: (1) Low pulp consistency (2) Proper agitation during soaking period, (3) Sufficient time of reaction.

Actual washer operation is controlled by the new

FREDERIC C. CLARK, President

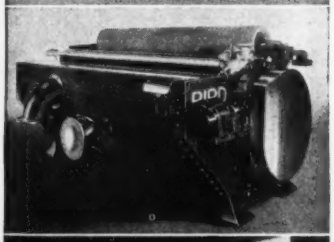
HAROLD R. MURDOCK, Vice President

5 WAYS TO MAKE
MORE AND BETTER PAPER AT LOWER COST

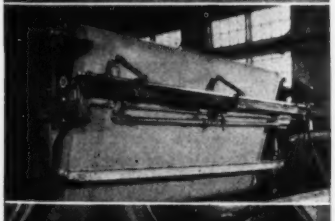


NEW BIRD SCREENS provide the one best combination of capacity and screen slot size — the surest way to improve paper quality with lowest screening cost per ton.

TRIPLE TREATMENT BIRD CENTRIFINING means maximum efficiency of dirt removal. Bird Centrifiners get the dirt, both heavy and light and do it at minimum cost.



A BIRD SAVE-ALL SYSTEM of white water recovery produces highest net return per pound of fibre recovered. The simplest, most practical, flexible and compact system available.



VICKERY CONDITIONED FELTS are continuously clean and uniform with no shut-downs for washing. There is maximum water removal at the presses where it costs least.

VICKERY DOCTORED ROLLS, press rolls, breast rolls, wire rolls, dryers, calender and super-calender rolls, are continuously clean and polished. They make better paper and more of it per day. Roll maintenance cost is cut way down.

Ask us for the facts and figures as they apply to your *paper*

BIRD MACHINE COMPANY
SOUTH WALPOLE • MASSACHUSETTS

method of measuring the amount of organic impurities remaining after washing. Organic substances are determined by the amount of oxygen required for their complete oxidation by means of potassium iodate in an acid solution. Results are expressed in the number of milligrams of oxygen consumed by 100 cc. of the residual water. This so-called "oxygen number" is an indication of the degree of washing.

The results of several oxygen number determinations are discussed in relation to the washing of pulp and to the physical properties of the pulp.

D. C. Everest, Luncheon Speaker

Following the first general session the men assembled for luncheon at the Northland Hotel. J. M. Conway, president of Hoberg Paper Mills presided as chairman. Messages of welcome were made by the representative of Mayor Alex Biemeret of Green Bay and A. B. Hansen, general chairman of the meeting. The response was made by F. C. Clark, president of TAPPI. The main speaker was D. C. Everest of the Marathon Paper Mills and president of the American Paper and Pulp Association. Mr. Everest said in part, "What we need is some technical knowledge expended on the development of new uses and the finding of ways to utilize the great quantity of paper products now available.

"I believe we have need today for a new order of technicians, and the new paper engineer will not supplant the present technical man. Perhaps it is unfair to ask those who have built up this gigantic productive machine to find new uses for the results of their efforts, but such a solution will prove of greater dollars and cents return than seems possible in further reductions of cost of production."

Mr. Everest acknowledged the work of TAPPI members in "at least four major developments which have greatly added to production in this country." First, he said, was the development of the kraft board industry in the south, really started in 1928. A second development was the large increase in production of bleached and unbleached sulphite on the west coast. Another was the growth in manufacture of high grade bleached sulphate pulp, which he believes has almost unlimited possibilities. Coating of papers on the paper machine was the fourth development referred to by the speaker.

In the afternoon the technical session was resumed under the chairmanship of F. C. Clark. All papers were presented by members of the staff of the Forest Products Laboratory, Madison, Wis.

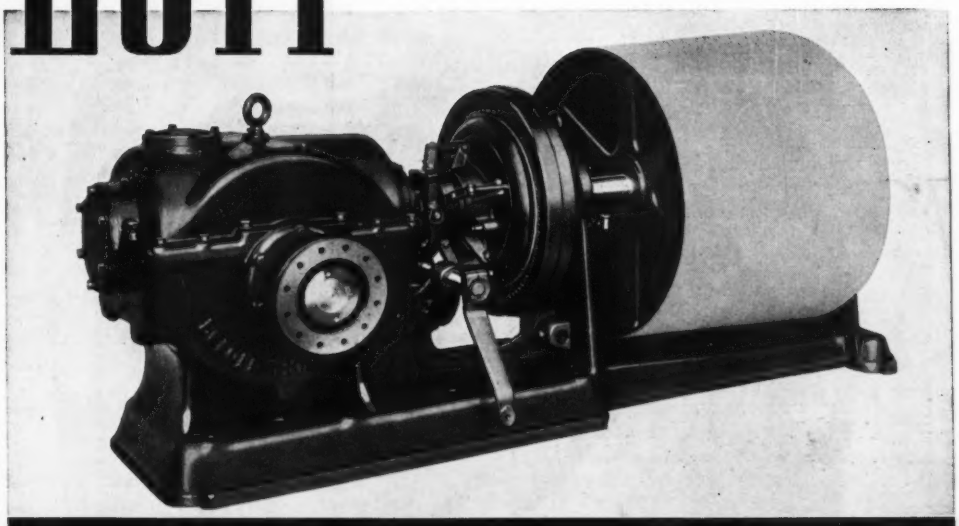
G. H. Chidester and J. N. McGovern discussed "Effect of Growth Variables on the Pulping of Western Hemlock by the Sulphite Process." This showed an examination of the position of wood in the tree, heartwood and sapwood contents, age, and the growth rate as factors affecting the yield and quality of sulphite pulp from western hemlock. Another paper by these two authors "The Effect of Modified Soda Base Sulphite Liquors in Pulping," brought out the fact that very strong, light-colored pulps were produced from shortleaf pine and other conifers and hardwoods by cooking with liquor containing neutral sodium sulphite alone or with addition of relatively small amounts of sodium bicarbonate, sodium sulphite or sodium hydroxide to give a pH range from 8 to 11.

S. L. Schwartz presented the following paper of which M. W. Bary is coauthor: "Chemistry of the Alkaline Pulping Processes V. Effect of Chemical Ratio and Initial Concentration on the Rate of Delignification and Hydrolysis." Mr. Schwartz said in part that from the data obtained from two small-scale pulping studies the ratio of chemical to wood though an important industrial consideration, was shown to be a pseudo-variable. Beyond the kraft range the effect of increasing concentration was found to be pronounced. Increasing the chemical ratio was shown to maintain the mean concentration throughout the digestion.

The next paper "The Crystalline Arrangement of Holocellulose" by G. J. Ritter and R. L. Mitchell was presented by Dr. Ritter who said in part that in a study of the optical properties of holocellulose, interesting data have been developed on a crystal ar-

PICTURE TAKEN AT BANQUET OF THE TECHNICAL ASSOCIATION, FRIDAY EVENING, SEPTEMBER 9, 1938.

BELOIT



HEAVY DUTY
Hypoid Gear Drive

● **Gears cut of special steel are totally enclosed and operate in bath of oil. Gear and pinion shafts are mounted on roller bearings which are automatically lubricated.**

Equipped with improved Beloit automotive type clutch having unusually large air-cooled friction plate area. Oil lubricated throw out collar.

BELOIT IRON WORKS PAPER MACH'Y BELOIT WIS.

THE BELOIT WAY IS THE MODERN WAY

BELOIT IRON WORKS, Beloit, Wisconsin, U. S. A.

rangement and other elements of the fine structure of this material.

The next paper by G. J. Ritter and William Van Beckum, "Chemical Composition of Holocellulose," was presented by Mr. Van Beckum. Data were given on the comparative composition of holocellulose, hydrolyzed holocellulose, and Cross and Bevan Cellulose.

"Lignin Investigations," by E. E. Harris and Homer Adkins was next given by Mr. Harris who pointed out that three lignins were heated in hydrogen at 170 to 400 atmospheres and 250 to 260 deg. C. producing: methanol, n-propylcyclohexanol-1, 4-n-propylcyclohexanediol-1-2, and 3-4 (hydroxycyclohexyl)-propanol-1. Properties of the residue units present in lignins containing 15 or more carbon atoms.

Harvest Festival

In the evening about 800 papermakers and their wives assembled at the Riverside Ballroom. Nearly all were dressed in appropriate rustic costumes and the ballroom was beautifully decorated for the occasion. Music was furnished by Bill Carlsen's orchestra, a floor show and singing by the famous Green Bay Y. M. C. A. Glee Club added much to the gala affair. Prizes for the most original costumes were given to Mr. and Mrs. W. J. Servotte of Green Bay, and to Mr. and Mrs. Al Stone of York Haven, Pa. Mr. and Mrs. D. G. Moon of Savannah, Ga., received honorable mention because of the novelty of their costumes.

Friday Morning Session

All of the papers presented at the Technical Session of Friday morning, September 9 were based on work done by staff members and advanced students of the Institute of Paper Chemistry, Appleton, Wis. These included the following:

"Sulphite Pulping of Douglas Fir", by E. B. Brookbank, Jr.

"An Investigation of the Flocculation of Papermaking Fibers", by J. C. Wollwage.

"A Fundamental Study of the Removal of the Constituents of Wood in the Alkaline Cooking Process", by F. E. Brauns and W. S. Grimes.

"The Influence of Humidity on Changes in Diameter and Length of Sulphite Fibers," by J. P. Widener.

"An Investigation of the Optical Scattering and Absorption Coefficients of Dyed Hand Sheets and the Application of the I.C.I. System of Color Specification to These Hand Sheets", by W. J. Foote.

HARVEST FESTIVAL, THURSDAY NIGHT.

A GROUP AT THE HARVEST FESTIVAL.

Friday Afternoon Events

Following an informal luncheon at the Northland Hotel those present either visited the Institute of Paper Chemistry, the mills of Green Bay and the Fox River Valley or entered the sports programs. A golf tournament was held at the Oneida Golf and Riding Club and a Skeet and Trap Shoot at the Green Bay Gun Club.

Banquet at Riverside

In the evening of Friday the formal banquet and ball was held. Frank P. Vaughn, general manager of the Bay West Paper Company was toastmaster. Prizes for various contest winners were presented by A. B. Hansen. G. S. Brazeau announced that the 1940 fall meeting of TAPPI will be held at Seattle, Wash. D. G. Moon invited those present to attend the Savannah, Ga. Paper Festival in April 1939.

The principal speaker was C. A. Dykstra, president of the University of Wisconsin, who commented on his experiences and thoughts relating to his recent visit to European countries. Dancing followed the speaking program.

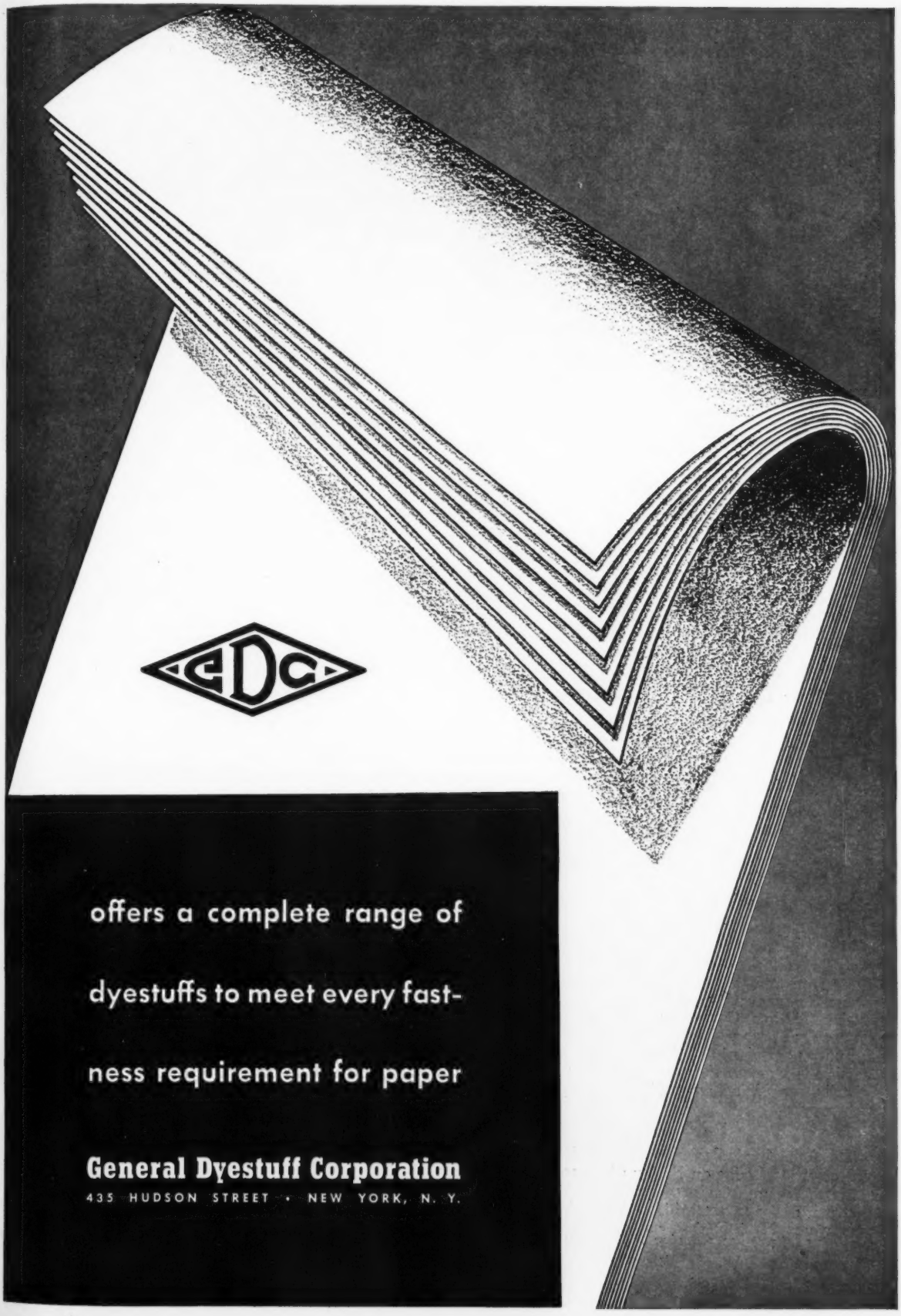
Heat Production and Transfer Session

On Saturday morning Russel Le Roux presided at the technical session. B. F. Smith and H. A. DuBois of the Kimberly-Clark Corporation presented "Data on Heat Exchanger Performance." Methods are outlined for calculation of simple heat exchangers together with actual tests of commercial equipment.

The second paper was "Economics of High Pressure Steam for Paper Mill Power Plants," by A. Kolflat, Sargent and Lindy. Mr. Kolflat said in part that the plant management in its endeavor to produce paper at the lowest possible cost, is interested in obtaining first a reliable steam plant, and second, one which gives the minimum annual cost considering both fixed charges and operating cost.

The subject of economics of high pressure steam for paper mill power plants is discussed in this paper in three sections (1) Heat Economy or fuel savings which may be expected by increase in steam pressure; (2) First cost of steam equipment as affected by an increase in design pressure; and (3) comparison of combined annual fuel cost and fixed charges. The first cost and operating cost for different steam pressures is analyzed for three typical plant sizes.

The last paper of the Saturday Session was "Steam Generation for Paper Mills," by M. H. Kuhner, Riley Stoker Corporation. Mr. Kuhner said that the consumption of steam and power in the pulp and paper


GDC
offers a complete range of
dyestuffs to meet every fast-
ness requirement for paper
General Dyestuff Corporation
435 HUDSON STREET • NEW YORK, N. Y.

process is particularly favorable for the generation of electric power as a by-product of the process steam. Startling savings in fuel have been realized by these mills which have modernized their power plants by installing high pressure steam generating equipment. By-product power, as contrasted with power generated by the condensing cycle, is surprisingly cheap.

Door County and Maxwelton Braes

Following the technical session those present joined the cavalcade of sightseers in a visit to the beautiful Door County peninsular Maxwelton Braes and other interesting places. A golf tournament was held at Maxwelton Braes. This was followed by dinner and a pleasant social program.

On Sunday many attended the professional football game between the Green Bay Packers and the Cleveland Rams.

Ladies' Program

Under the able chairmanship of Mrs. H. W. Gochnauer and Ralph Reed, the women attending the meeting had a very interesting program.

On Thursday, luncheon was enjoyed at the Beaumont Hotel followed by a trip to the historical points in and near Green Bay and to the Kraft-Phenix Cheese plant. There was a tea at the Oneida Golf and Riding Club. In the evening the ladies joined with the men at the Harvest Festival Party at Riverside.

The Friday program consisted of a golf tournament at Oneida followed by a trip to Nicolet Landing with luncheon and bridge at Rockwood Lodge. In the evening they attended the general banquet and ball at Riverside.

On Saturday they were taken to Door County where luncheon was served at Eagle Inn, Ephraim, Wis. Golf and bridge were played at Maxwelton Braes following which there was a dinner and special entertainment.

Souvenir Program and Exhibits

A very attractive 144 page souvenir program was issued to registrants. This included the advertisements of convention boosters and details about the meeting and about Green Bay. A very attractive exhibit of paper mill supplies was well attended by those present.

Firms Which Made Exhibits

The following firms are among those which made exhibits at the convention:—Allis-Chalmers Manufacturing Company; Beloit Iron Works; Cleveland Cliffs Iron Company; Coe Manufacturing Company; Crane Company; Brown Metal Company, Inc.; DeZurick Shower Company; Gagnon Clay Products Company; Pittsburgh Plate Glass Company; Sargent & Lundy; Standard Oil Company (Indiana); Strong, Carlisle & Hammond Company, Meyer-Ekstrom Co., Distributors; Wadhams Oil Company; Walworth Company.

Prize Winners

The following ladies won prizes at the bridge party at Rockwood Lodge on Friday afternoon:

Mrs. William Plank, of Appleton, Wis., won the first prize in contract bridge. The other prize winners were: Mrs. F. A. Pascoe, Wisconsin Rapids, Wis.; Mrs. J. J. Nylund, Evanston, Ill.; Mrs. E. P. Gleason, Port Edwards, Wis.; Mrs. Art McPhillips, Beloit, Wis.; Mrs. H. F. Winchell, Chester, Pa.; Miss Ida Bickley, Williamsburg, Pa.; Mrs. Russell Bauman, Green Bay, Wis.; Mrs. J. Burnette, Chicago, Ill.; Mrs. VanNort, Chicago, Ill., and Mrs. Dell McCoy.

Mrs. M. J. Freeman, of Midland, Mich., won the first prize in auction bridge. The other winner was Mrs. F. J. Timmerman, of Green Bay, Wis.

The winners of the door prizes at the bridge party were Mrs. Pierre Drewson, of Sandusky, Ohio, and Mrs. Mary Gore, of Green Bay, Wis.

Golf Prizes

The prize winners at the golf tournament at the Oneida Golf and Riding Club on Friday afternoon were as follows:

First low gross for members—W. F. Kerwin, of the Green Bay Traffic Association. Second low gross—H. Sherman, of Northern Paper Mills. Third low gross—M. M. Klossen, of Buffalo Pumps, Inc.

First low gross for salesmen—D. M. Irwin, of Chase Brass and Copper Company. Second low gross—H. D. McGowan, of the General Chemical Company. Third low gross—W. J. Plank, of J. J. Plank & Co.

First low net for members—A. B. Hansen, of Northern Paper Mills. Second low net—J. W. Boren.

The winners of special golf prizes were—Don Beisel, of Wadhams Oil Company for the longest drive on the first hole; B. Yule, of F. C. Huyck & Sons, for the nearest cup on No. 3. Sam Andersen, of Hooker Electrochemical Company for nearest cup on No. 11. S. Kukiloch, of Neenah Paper Company, for longest drive on No. 2. John Hansen, of Badger Paper Mills, for nearest cup on No. 17. H. E. Patterson, of the Wood Conversion Company, won the prize for having the highest score—147.

First low net for salesmen—C. C. Bleil, of E. I. DuPont de Nemours & Co. Second low net—R. D. Totten, of Ciba Company, Inc.

Skeet Prizes

The winners of the skeet and trap shoot held at the Green Bay Gun Club on Friday were—G. A. Koebke, Manitowoc Engineering Works, Ivar Ekholm, National Aniline Chemical Company, E. P. Gleason, Nekoosa Edwards Paper Company. T. W. Olson, Nekoosa Foundry and Machine Works, and Milan Boex, Northern Paper Mills.

Celebrates Golden Anniversary

The Martin Cantine Company, of Saugerties, New York, manufacturers of coated papers, on Monday and Tuesday, September 12 and 13, acted as host to paper merchants from all over the country on the occasion of the 50th anniversary of the founding of the company. The meeting took place at the Woodstock Country Club, near Saugerties.

Martin Cantine was among the first to realize the importance of coated paper to the graphic arts, after the invention of the halftone, and to develop papers for the growing requirements of halftone and color printing.

In connection with the anniversary, an interesting booklet has been issued which not only traces the development of the "guild" of paper coaters that have grown up around Mr. Cantine, but shows the newest methods used in their processes. The book is profusely illustrated and is filled with interesting reading matter.

• EBG maintains a thorough "follow through" policy in serving customers' needs for liquid chlorine. It begins with a closely supervised delivery system and includes expert technical assistance in every type of application. You'll enjoy the friendly and willing cooperation that goes with every shipment of EBG Liquid Chlorine. It's one of the reasons why customers say, "They treat you right at EBG!"

ELECTRO BLEACHING GAS COMPANY

MAIN OFFICE: 60 EAST 42nd STREET, NEW YORK, N. Y. • PLANT: NIAGARA FALLS, N. Y.

EBG Liquid Chlorine

FIRST IN THE COUNTRY

Those Who Attended the Convention

Official Registration of the Technical Association of the Pulp & Paper Industry

A

Mr. and Mrs. Allen Abrams, Rothschild, Wis.
A. G. Aitchison, New York, N. Y.
Sam Anderson, New York, N. Y.
Mr. and Mrs. E. Anderton, Brunswick, Ga.
Bruce Armstrong, Muncie, Pa.
S. I. Arnovosky, Ames, Iowa.
Fred Attwood, Chicago, Ill.
U. S. Ansley, Atlanta, Ga.
Albert Allen, Foxboro, Mass.
E. P. Arpin, Neenah, Wis.

B

C. L. Bachelder, Kalamazoo, Mich.
Mr. and Mrs. A. E. Bachmann, Sheldon Springs, Vt.
R. R. Baker, E. Pittsburgh, Pa.
C. M. Baker, Madison, Wis.
H. A. Balding, Milwaukee, Wis.
A. N. Ball, Hull, Quebec, Can.
A. Bankus, San Francisco, Cal.
L. G. Barlow, Oshkosh, Wis.
Mr. and Mrs. Russel Bat[illegible]an, Green Bay, Wis.
E. B. Beede, Chicago, Ill.
K. H. Bedell, Chicago, Ill.
D. A. Beisel.
M. H. Bennett, Watertown, N. Y.
Mr. and Mrs. H. G. Bickley, Williamsburg, Pa.
Miss Ida Bickley, Williamsburg, Pa.
Mr. and Mrs. O. T. Birkeness, Chicago, Ill.
C. C. Bleil, Chicago, Ill.
W. Doyle Boggess, Indianapolis, Ind.
G. D. Browne, E. Pittsburgh, Pa.
A. T. Brainerd, Chicago, Ill.
F. W. Brainerd, Chester, Pa.
Paul Bray, Orono, Me.
G. S. Brazeau, Everett, Wash.
E. B. Brookbank.
C. O. Bruden, Madison, Wis.
Mr. and Mrs. S. B. Bugge, Tomahawk, Wis.
Lewis C. Burdick, Deferiet, N. Y.
Edmund Burke, Jr., Chicago, Ill.
James E. Burkross, Chicago, Ill.
Mr. and Mrs. J. J. Burnett, Chicago, Ill.
J. R. Bush, Minneapolis, Minn.
Mr. and Mrs. Geo. Biebel, Green Bay, Wis.
Miss Selma Blair, TAPPI, New York, N. Y.
Mr. and Mrs. Milan Boex, Green Bay, Wis.
Chas. W. Boyce, New York, N. Y.
Mr. and Mrs. Geo. Burridge, Green Bay, Wis.
Mr. and Mrs. Wm. Buchanan, Appleton, Wis.
I. Bencowitz, New Gulf, Texas.
C. G. Bigelow, Chicago, Ill.
Mr. and Mrs. J. W. Boren, Marinette, Wis.
Martin Burke Jr., Menominee, Mich.
H. W. Butterbaugh, Kenosha, Wis.
P. K. Baird, Madison, Wis.
H. W. Bialkowsky, Menasha, Wis.
E. R. Beller, Cleveland, Ohio.

C

Mr. and Mrs. P. M. Chiumihatto, Green Bay, Wis.
Mr. and Mrs. W. C. Christensen, Green Bay, Wis.
Mr. and Mrs. J. M. Conway, Green Bay, Wis.
R. D. Cords, Green Bay, Wis.
Mr. and Mrs. E. D. Crim, Green Bay, Wis.
Mr. and Mrs. R. J. Cunningham, Green Bay, Wis.
Olin W. Callingham, Kalamazoo, Mich.
John Campbell, Glen Falls, N. Y.
Miss Kathleen Carey, Chicago, Ill.
P. J. Carlisle, Niagara Falls, N. Y.
P. A. Carlson, Chicago, Ill.
Chas. Carpenter, Savannah, Ga.
John F. Carroll, Harrisville, N. Y.
R. C. Carson, Chicago, Ill.
Ferry Casciani, Niagara Falls, N. Y.
J. B. Castino.
C. H. Champion, New York, N. Y.
G. H. Chidester, Madison, Wis.
C. H. Child, Lawrence, Mass.
C. L. Clark, New York, N. Y.
Mr. and Mrs. Fredric C. Clark, Newton, Mass.
James B. Clarke, Chicago, Ill.
Arthur A. Coffin, New York, N. Y.
Eugene W. Cole, Kalamazoo, Mich.
C. Cook, Milwaukee, Wis.
R. G. Conklin, Milwaukee, Wis.
John Cornell, New York, N. Y.
Mr. and Mrs. A. H. Croup, Erie, Pa.
C. W. Crumb, Chicago, Ill.
C. E. Curran, Madison, Wis.
C. J. Clarke, Chicago, Ill.
Harold Cross, Green Bay, Wis.
N. C. Cooper, Wilmington, Del.
Steve Colucci, Youngstown, Ohio.
Wm. B. Colitre, Fulton, N. Y.

D

Mr. and Mrs. Edw. Den Doven, Green Bay, Wis.
Miss Ruth Dunning, Green Bay, Wis.
Mrs. Thomas Dwyer, Green Bay, Wis.
Roy Davis, Detroit, Mich.
Mr. and Mrs. C. L. Davis, New Orleans, La.
Paul B. Davidson, Pittsburgh, Pa.
Mr. and Mrs. J. H. Davidson, Minneapolis, Minn.
W. W. Decker, New York, N. Y.
S. R. Davis, Eau Claire, Wis.
Jacob Edge, Downington, Pa.
Charles Di Carlo, Wausau, Wis.
F. H. Denham, New York, N. Y.
V. S. Denison, Beloit, Wis.
G. K. Dickerman, Wisconsin Rapids, Wis.
Mr. and Mrs. R. H. Doughty, Fitchburg, Mass.
Mr. and Mrs. Pierre Drewsen, Sandusky, Ohio.
Karen Drewsen, Sandusky, Ohio.
J. R. Dufford, Morrisville, Pa.
David de Zurik, Sartell, Minn.
J. E. McDonald, E. Chicago, Ind.

E

Robt. L. Eminger, Miamisburg, Ohio.
D. C. Everest, Menasha, Wis.
Ivar Ekholm, New York, N. Y.
George A. Engert, Fulton, N. Y.
H. J. Elgin, Chicago, Ill.

F

Mr. and Mrs. Don Fairbairn, Green Bay, Wis.
Mr. and Mrs. John Fogarty, Green Bay, Wis.
John H. Faunce, Middletown, Ohio.
Mrs. Milton Fillius, Rochester, N. Y.
L. E. Fitzgerald, Kalamazoo, Mich.
M. F. Flotow, Niles, Mich.
M. J. Foley, Chicago, Ill.
Paul Foster, Chicago, Ill.
Pell W. Foster, Jr., New York, N. Y.
James A. Foxgrover, Kalamazoo, Mich.
Mr. and Mrs. H. D. Freeman, Midland, Mich
Wm. Fannon, Appleton, Wis.
L. L. Forward, Chicago, Ill.

G

Mr. and Mrs. H. W. Gochnauer, Green Bay, Wis.
W. P. Gargan, Seneca Falls, N. Y.
W. A. Geen, Chicago, Ill.
Wm. A. Geiger, Chicago, Ill.
Thomas Gerace, Deferiet, N. Y.
H. B. Gerber.
Edmund Getty, Westernport, Md.
H. W. Gleichert, Barberten, Ohio.
W. F. Gillespie, Bogalusa, La.
Otto J. Goeppinger, New York, N. Y.
F. C. Goodwill, Deferiet, N. Y.
J. E. Goodwillie, Beloit, Wis.
Mr. and Mrs. W. E. Greene, New York, N. Y.
Mr. and Mrs. J. W. Grimes, Green Bay, Wis.
Tom Gillespie, Chicago, Ill.
A. B. Green, Needham, Mass.
W. J. Garding, Merrill, Wis.
W. S. Grimes, Menasha, Wis.
W. R. Grunow, Brackenridge, Pa.
Mr. and Mrs. E. P. Gleason, Port Edwards, Wis.

H

Mr. and Mrs. A. B. Hansen, Green Bay, Wis.
Lois Hans, Chicago, Ill.
Mr. and Mrs. John A. Hanson, Marinette, Wis.
W. H. Harding, Stamford, Conn.
Mr. and Mrs. F. J. Harwood, Green Bay, Wis.
A. A. Harden, New York, N. Y.
Mr. and Mrs. Mace Harris, Cloquet, Minn.
Elwin E. Harris, Madison, Wis.
Ward Harrison, Milford, N. J.
W. M. Haves, Rhinelander, Wis.
G. L. M. Hellstrom, Montreal, Quebec, Can.
C. F. Harms, Minneapolis, Minn.
I. W. Hemphill, New York, N. Y.
W. O. Hisey, Syracuse, N. Y.
W. G. Hoffman, Chicago, Ill.
Mr. and Mrs. W. F. Hoffman, Cloquet, Minn.
Mr. and Mrs. Roy W. Holden, Newton Upper Falls, Mass.
Mr. and Mrs. A. S. Holden, Painesville, Ohio.
Clayton Holt, Pittsburgh, Pa.
H. A. Horan, Cedar Rapids, Iowa.
Mr. and Mrs. C. M. Howell, Chester, Pa.
T. A. Howells, Munising, Mich.
Raymond P. Hill, Orange, N. J.
Gordon W. Hughes, Manistique, Mich.
A. J. Hutchinson, Green Bay, Wis.
Mr. and Mrs. S. D. Hastings, Green Bay, Wis.
G. I. Hoover, Thorold, Ontario.
Mr. and Mrs. G. L. Hopkins, Green Bay, Wis.
C. F. Hayden, Chicago, Ill.
J. J. Healy, Boston, Mass.
Mrs. Gordon W. Hughes, Manistique, Mich.
J. F. Harding, Hamilton, Ohio.
Louis Hausmann, Chicago, Ill.
J. R. Hettelsater, Chicago, Ill.

I

D. M. Irwin, Milwaukee, Wis.
Tom Ireland, Chicago, Ill.

J

Neil Johnson, Chicago, Ill.
Mr. and Mrs. L. S. Johnson, Cornell, Wis.
R. G. Johnston, Quebec, Canada.
Mr. and Mrs. E. C. Jacobi, Green Bay, Wis.
Mr. and Mrs. Harry Johnson, Green Bay, Wis.
Donald T. Jackson, Erie, Pa.
Roy B. Johns, New York, N. Y.
Hugh Jones, Milwaukee, Wis.
J. H. Jackson, Chicago, Ill.
Mrs. Donald Jackson, Erie, Pa.
L. G. Janett, Chicago, Ill.
B. Johnson, Erie, Pa.

K

C. D. Kelly, Clinton, Iowa.
H. E. Karberg, Merritton, Ontario.
Mr. and Mrs. V. A. Kaufmann, Minneapolis, Minn.
W. J. Kelly, Chicago, Ill.
Paul Keyser, New York, N. Y.
Mr. and Mrs. D. D. Kimball, Rochester, N. Y.
R. P. Kite, New York, N. Y.
M. M. Klosson, Buffalo, N. Y.
Mr. and Mrs. M. F. Knack, Monroe, Mich.
Mr. and Mrs. W. F. Kerwin, Green Bay, Wis.
Arthur D. Kirk, La Crosse, Wis.
Mr. and Mrs. Robert Kissel, Green Bay, Wis.
Mr. and Mrs. Gus Klaus, Green Bay, Wis.
Richard Knechtges, Green Bay, Wis.
Mr. and Mrs. Wm. Kowaleski, Green Bay, Wis.
Alf Kolflat, Chicago, Ill.
R. L. Kreyling, Philadelphia, Pa.
G. H. Krohm, Milwaukee, Wis.
J. L. Kubicka, Chicago, Ill.
M. H. Kuhner, Worcester, Mass.
Stephen Kukolich, Neenah, Wis.

L

T. E. Lagerstrom, New York, N. Y.
E. M. Leavitt, Ontonagon, Mich.
J. A. Lee, New York, N. Y.
O. W. Lemke, Chicago, Ill.
C. E. Libby, Syracuse, N. Y.
Frank Libby, Parchment, Mich.
Frank Lillie, Chicago, Ill.
Mr. and Mrs. Larry Lynd, New York, N. Y.
R. J. LeRoux, Appleton, Wis.
Mr. and Mrs. A. J. Luth, Bonduel, Wis.
C. W. Larsen, Milwaukee, Wis.
G. T. Latham, Chicago, Ill.
H. T. Latham, Chicago, Ill.
E. A. Lauring, International Falls, Minn.
H. W. Laymon, Chillicothe, Ohio.
A. J. Leighton, Chicago, Ill.
Harold Logan, Chicago, Ill.
John O. Logan, Chicago, Ill.
J. H. Loomis, New York, N. Y.
John H. Long, Wilmington, Del.

M

Mr. and Mrs. N. L. Malcove, Green Bay, Wis.
John Maloney, Green Bay, Wis.
Mr. and Mrs. Earle Murray, Green Bay, Wis.
Mrs. John Maloney, Green Bay, Wis.
Mr. and Mrs. A. K. McNaughton, Green Bay, Wis.
Mr. and Mrs. Jim Martin, Green Bay, Wis.
Mr. and Mrs. M. D. Munger, Green Bay, Wis.
Mr. and Mrs. A. D. Murphy, Green Bay, Wis.
M. F. McCombs, New York, N. Y.
D. W. McCready, Ann Arbor, Mich.
William McGraw, Milwaukee, Wis.
R. C. McKee, Chicago, Ill.

R. B. McKinney, Wilmington, Del.
Mr. and Mrs. C. J. McMahon, Appleton, Wis.
A. McLintock, New York, N. Y.
Wm. M. McNair, Chicago, Ill.
L. J. McNamara, Rothschild, Wis.
Mr. and Mrs. A. McPhillips, Beloit, Wis.
C. E. Macklem, Beloit, Wis.
Roderick Mathieson, Detroit, Mich.
Mrs. D. H. McCoy, Green Bay, Wis.
H. C. McGown, Milwaukee, Wis.
Ralph McKee, New York, N. Y.
Hoke Martin, Kalamazoo, Mich.
H. R. Mathias, Chicago, Ill.
Mr. and Mrs. R. W. Meyer, Peshtigo, Wis.
James M. McAlear, Chicago, Ill.
Edwin L. McCormick, International Falls, Minn.
John D. Moffatt, Green Bay, Wis.
R. T. Moore, Monroe, La.
Fred Murphy, Green Bay, Wis.
Mr. and Mrs. Fred Motschman, Marinette, Wis.
Howard Morgan, Munising, Mich.
G. M. Markle, Chicago, Ill.
Mr. and Mrs. R. B. Martin, Newark, N. J.
R. H. Melin, Chicago, Ill.
Frank Murphy, Appleton, Wis.
D. B. Mason, New York, N. Y.
A. D. Merrill, Watertown, N. Y.
Mr. and Mrs. E. B. Miller, Milwaukee, Wis.
John S. Moher, Green Bay, Wis.
A. E. Montgomery, Chicago, Ill.
Mr. and Mrs. W. H. Monsson, Chicago, Ill.
Mr. and Mrs. D. G. Moon, Savannah, Ga.
H. A. Morrison, New York, N. Y.
Mr. and Mrs. L. A. Moss, Stevens Point, Wis.
Harold Murdock, Canton, N. C.
J. M. Murphey, Chicago, Ill.
M. C. Moore, Wilmington, Del.

N

Mr. and Mrs. H. L. Nichols, Green Bay, Wis.
Mr. and Mrs. Carl Nystrom, Green Bay, Wis.
Miss M. Nelson, Green Bay, Wis.
H. E. Nelson, Port Edwards, Wis.
L. E. Wellman, Port Edwards, Wis.
Mr. and Mrs. Roy Nilsen, Cloquet, Minn.
H. Norman.
G. W. E. Nicholson, Panama City, Fla.
Mr. and Mrs. J. J. Nylund, Chicago, Ill.
John H. Nobel, Nashua, N. H.
C. F. Naber, Shawano, Wis.

O

Mr. and Mrs. T. W. Olson, Wisconsin Rapids, Wis.
E. Olson, Chicago, Ill.
K. E. Olson.
Mr. and Mrs. P. W. Olsen, Port Edwards, Wis.
R. O'Donoghue, New York, N. Y.
Emil Ott, Wilmington, Del.

P

Mr. and Mrs. A. W. Pesch, Panama City, Fla.
D. W. Pease, Chicago, Ill.
E. Peterson, Akron, Ohio.
C. Passenheim, New York, N. Y.
C. J. Clark, New York, N. Y.
Mr. and Mrs. Clifford Patch, Bangor, Me.
Mr. and Mrs. W. E. Phillips, Chicago, Ill.
Mr. and Mrs. R. H. Purdy, Appleton, Wis.
Mr. and Mrs. T. A. Pascoe, Port Edwards, Wis.
W. C. Pugh, East Pittsburgh, Pa.

R

Francis G. Rawling, Luke, Md.
J. S. Reichert, Niagara Falls, N. Y.
Ray Riley, New York, N. Y.
Geo. J. Ritter, Madison, Wis.
T. C. Roberts, Beloit, Wis.
J. D. Rue, Niagara Falls, N. Y.
H. A. Rothschild, Neenah, Wis.
R. Radsch, Appleton, Wis.
J. H. Read, Chicago, Ill.
Sam J. Robinson, Eau Claire, Wis.
Mr. and Mrs. U. A. Rothermel, Milwaukee, Wis.
Chas. H. Rybolt, Middletown, Ohio.
Mr. and Mrs. Ralph Reed, Green Bay, Wis.
Mr. and Mrs. Staber Reese, Green Bay, Wis.

S

J. R. Salvesen, Rothschild, Wis.
Ralph Sargent, Chicago, Ill.
Walter Savell, New York, N. Y.
Hugo Schapiro, Rittman, Ohio.
J. Scheuerman, New York, N. Y.
Harry Schauer, Milwaukee, Wis.
Fred Schorken, Filer City, Mich.
P. R. Schreiber, Chicago, Ill.
S. L. Schwartz, Madison, Wis.
George L. Schwartz, Wilmington, Del.
John Schuber, Syracuse, N. Y.
Mr. and Mrs. T. M. Scurggs, St. Louis, Mo.
H. Sinclair, Cambridge, Mass.
Mr. and Mrs. Howard Sheldon, Green Bay, Wis.
P. A. Snowman, Cedar Rapids, Iowa.
J. J. Stanton, Milwaukee, Wis.
C. F. Stein, Milwaukee, Wis.
A. C. Stepan, Chicago, Ill.
R. R. Stoltz, East Pittsburgh, Pa.
Mr. and Mrs. A. I. Sippola, Green Bay, Wis.
Mr. and Mrs. Robert G. Smith, Green Bay, Wis.
Mr. and Mrs. W. J. Servotte, Green Bay, Wis.
Mr. and Mrs. H. W. Sherman, Green Bay, Wis.
Mr. and Mrs. A. G. Stone, York Haven, Pa.
W. H. Swanson, Neenah, Wis.
O. P. Sather, Duluth, Minn.
N. A. Shepard, Stamford, Conn.
Mr. and Mrs. Roscoe H. Smith, Cleveland, Ohio.
B. Schroeder, Worcester, Mass.

T

William F. Talbot, Framingham, Mass.
Sanford E. Thompson, Boston, Mass.
A. H. Thuerer, Appleton, Wis.
E. B. Taylor, Kalamazoo, Mich.
Mr. and Mrs. F. J. Timmerman, Green Bay, Wis.
Mr. and Mrs. A. E. Tuttle, Appleton, Wis.
Mr. and Mrs. H. W. Tuttrup, Green Bay, Wis.
Mr. and Mrs. E. A. Timmerman, Green Bay, Wis.
W. S. Taylor, Kalamazoo, Mich.
J. J. Thompson, Chicago, Ill.
T. W. Toovey, Philadelphia, Pa.
R. D. Totten, Chicago, Ill.
John Traquair, Chillicothe, Ohio.
E. F. Tucker, Watertown, N. Y.
Mrs. A. S. Tucker, New Orleans, La.
J. A. Turner, Chicago, Ill.

U

Everett Uebrick, Port Huron, Mich.

V

Mr. and Mrs. E. J. Vickman, Green Bay, Wis.
Mr. and Mrs. Frank Vaughan, Green Bay, Wis.
Mr. and Mrs. E. A. Voigtman, Neenah, Wis.
Wm. Van Beckum, Madison, Wis.
L. G. Vandebogart, Oshkosh, Wis.
H. L. Vanderberg, Decatur, Ill.
L. R. Verdon, Kalamazoo, Mich.
C. Vicario, New York, N. Y.
Rex Vincent, Chicago, Ill.
H. K. Vinton, Chicago, Ill.
R. W. Van Kirk, Evanston, Ill.
Mr. and Mrs. J. L. Van Mort, Chicago, Ill.

W

J. P. Weidner, Green Bay, Wis.
Mr. and Mrs. Paul Williams, Green Bay, Wis.
Mr. and Mrs. H. G. Wintgens, Green Bay, Wis.
Mr. and Mrs. Edw. Wochenski, Green Bay, Wis.
Mr. and Mrs. L. G. Wood, Green Bay, Wis.
A. D. Wooley, Rumford, Me.
H. E. Walter, Cloquet, Minn.
R. S. Watson, Milwaukee, Wis.
W. E. Waymird, Appleton, Wis.
H. F. Bob Webber.
S. D. Wells, Combined Locks, Wis.
Pierre R. Welsch, Wyandotte, Mich.
H. E. Weston, Chicago, Ill.
Cash Whipple, Beloit, Wis.
Mr. and Mrs. J. E. Whitfield, Monroe, La.
Mr. and Mrs. E. R. Whittemore, Ames, Iowa.
E. H. Williams, Munising, Mich.
H. F. Winchell, Chester, Pa.
C. F. Witherell, Sartell, Minn.
J. E. Wollwage, Neenah, Wis.
Joseph Wedgewood, Neenah, Wis.

Y

B. A. Yule, Albany, N. Y.

Z

F. L. Zellers, Niles, Mich.
Henry Zeni, New York, N. Y.

August Newsprint Statistics

Production of newsprint in Canada during August 1938, amounted to 220,303 tons and shipments to 204,668 tons to the Newsprint Service Bureau. Production in the United States was 67,436 tons and shipments 66,006 tons, making a total United States and Canadian newsprint production of 287,739 tons and shipments of 270,674 tons. During August, 12,977 tons of newsprint were made in Newfoundland, so that the total North American production for the month amounted to 300,716 tons. Total production in August 1937 was 430,491 tons.

The Canadian mills produced 741,110 tons less in the first eight months of 1938 than in the first eight months of 1937, which was a decrease of thirty and six tenths percent. The output in the United States was 103,884 tons or sixteen and five tenths percent less than in the first eight months of 1937, in Newfoundland 72,554 tons or thirty and four tenths per cent less, making a total decrease of 917,548 tons, or twenty-seven and nine tenths per cent.

Stocks of newsprint paper at the end of August were reported at 194,917 tons for Canadian mills and 23,987 tons for United States mills, making a combined total of 218.904 tons compared with 201,839 tons on July 31, 1938.

Interstate Folding Box Co. Expands

[FROM OUR REGULAR CORRESPONDENT]

DAYTON, Ohio, September 11, 1938—Work on a $60,000 addition to the Interstate Folding Box company will be started next week, it was announced today by Sam Bergstein, president of the concern. The expansion program announced for the first time Friday, will permit increased production of a newly patented container. When work on the new building is completed about 150 additional persons will be employed by the company, Mr. Bergstein said.

Introduction of the new product was made in various localities during the summer and it met with considerable success. The new product, made of paper board, is particularly adaptable for use in preservation of liquids, fruits or vegetables.

Price of Kraft Board Advanced

Announcement has been made in the trade of an advance of $2.50 per ton in the price of kraft liner board, to become effective October 1. This will increase the minimum price to $45 per ton, from the currently quoted price of $42.50 per ton.

STONITE★ Rolls

TOP PRESS AND SMOOTHING

★ (*Ebonite and Granulated Stone Composite U. S. Patent 1,787,890 Re. 18,111*)

On the basis of results obtained with more than 1500 STONITE Top Press and Smoothing Press Rolls in service in 31 countries, we can definitely promise you a marked improvement in surface finish, a much closer approach to absolute uniformity on both sides and a sharp reduction in breaks. May we tell you what STONITE Rolls are doing on grades like yours?

STOWE-WOODWARD, INC. NEWTON UPPER FALLS • MASS.
NEW YORK OFFICE • WOOLWORTH BLDG.

Makers of WHITE STAR *Rubber Covered Rolls,* TANNITE *Couch Rolls*
STONITE *Top Press and Smoothing Rolls—All by the* COREWELD *Process*

Stowe-Woodward Rolls are made on the West Coast by HUNTINGTON RUBBER MILLS, INC., *35 West Lander St., Seattle, Washington*

Fox River Paper Co. At Appleton Is Sold

Property Will Be Acquired By A New Corporation Known As the Fox River Paper Corp., of Which E. A. Oberweiser Is President and General Manager — Sales Price Not Mentioned—Transfer Effective Oct. 1.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., September 13, 1938—Contract for the sale of the Fox River Paper Company, of this city, to a new corporation known as the Fox River Paper Corporation, was signed yesterday at the home of William C. Wing, Neenah, who retires from industry after twenty years as president of the Fox River Paper Company. The new corporation has E. A. Oberweiser, former president of the Whiting Plover Paper Company, Stevens Point, as president and general manager, and Col. M. E. Roberts, sales manager of A. B. Dick Company, Chicago, as executive vice-president. Other officers in the new corporation are R. F. Bellack, vice-president, for five years director of advertising and sales promotion for Whiting Plover; William M. E. Roberts, secretary; David E. Oberweiser, treasurer. Col. Roberts will remain with the Dick Company as sales counselor. No announcement of the price was made, but this deal is one of the largest in the paper industry in a decade.

The actual transfer will become effective October 1, and will involve the Fox River Mills, the Telulah Mill, former Patten Paper Company Appleton property, and all Fox River water power, buildings, machinery, goodwill and other assets.

Mr. Oberweiser joined the Whiting Plover Paper Company as secretary and general manager in 1910 and became president in 1930, following the death of George R. Whiting. Mr. Oberweiser retired in February of this year.

Mr. Wing became associated with the Fox River firm, in 1913 and soon became assistant general manager under the late H. G. Freeman, and later succeeded Mr. Freeman. Mr. Wing became president of the company and acquired control. In 1920 he bought the Telulah Mill and last year bought the Patten property.

Maxwell Issues Offset Booklet

The problem of combining the best type of artwork with the papers which will best bring out all the qualities of each medium has been simplified in a booklet on offset papers, recently published by The Maxwell Paper Company, Franklin, Warren County, Ohio, makers of Maxwell Offset and Maxwell Bond.

The booklet attractively shows the eight most widely used art mediums, namely black and white, colored photography, crayon, water color, montage abstraction, scratch board, line and wash and pen and ink drawings.

Using the same subject in each medium, the pictures are printed on the offset paper which the company recommends as the most suitable, in weight and finish, to best bring out the depth and detail furnished by each type of art.

The second portion of the booklet offers samples of the various colors, weights and finishes available in Maxwell offset papers. Copies of the booklet are available upon request to the company.

Big Pulp Shipments Arrive at Albany

[FROM OUR REGULAR CORRESPONDENT]

ALBANY, N. Y., September 12, 1938—Increased activity at the local port terminal indicate a busy fall season. Eight ocean vessels docked here during the past week and several others are expected within the next few days. Large shipments of wood pulp were carried in the holds of the Mallemak, the Heinger and the Belos which arrived during the week and a large force of stevedores are being employed in unloading. Among the arrivals expected within the next few days with wood pulp cargoes are the Trimero from Sweden and the Norwegian ship Haukesiell with several thousand tons of the imported product. Another foreign vessel, the Kartfanger, is expected to reach here late in the week. The working force at the terminal has been greatly enlarged to hasten unloading and plans are going forward towards making larger storage space. Virtually every warehouse shed at the port is now filled with foreign importations and the need for more space has become imperative.

Bibb Paper Co. Starts at Macon

MACON, Ga., September 12, 1938—J. C. Shutze of Atlanta announced last week a Macon branch of the Atlanta Paper Company had been established here.

The local unit is known as the Bibb Paper Company and is located at 311 Poplar street with Whitney T. Evans as manager. All employes, are Macon residents, Mr. Shutze said.

The company, which was started in 1868, manufactures and distributes corrugated boxes, shipping crates, folding boxes, laundry and dry cleaning supplies and all types of paper boxes.

Brightwater Employees Return To Work

[FROM OUR REGULAR CORRESPONDENT]

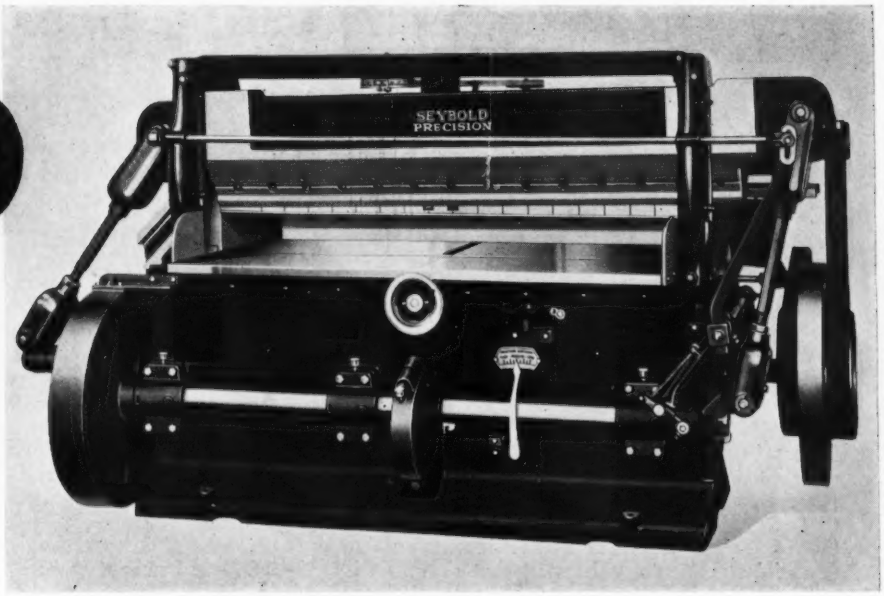
ADAMS, Mass., September 12, 1938—The three hundred unorganized employees of the Brightwater Paper Company of Adams who went on strike about ten days ago, have returned to work on a compromise wage adjustment involving a cut of two-cents an hour. The company proposal was five cents an hour. Raymond V. McNamara of the State Board of Conciliation and Arbitration was instrumental in bringing about the settlement.

Earl B. MacMillan Resigns

[FROM OUR REGULAR CORRESPONDENT]

HOLYOKE, Mass., September 12, 1938—Earl B. MacMillan of 4 Central avenue, South Hadley Falls, for a number of years sales manager of the Hampden Glazed Paper and Card Company of this city has resigned. He has been connected with the sales department of the company for the past 15 years. Mr. MacMillan recently returned from a trip to Europe.

★ SEYBOLD
PIONEER BUILDERS OF SUCCESSFUL CUTTING EQUIPMENT



WITH *Precision* TRIMMING, YOU INVITE BUSINESS *CONFIDENCE*

SALES AND SERVICE:

- New York:
  E. P. Lawson Co., Inc.
  426-438 W. 33rd Street
- Chicago:
  Chas. N. Stevens Co., Inc.
  110-116 W. Harrison Street
- Atlanta:
  J. H. Schroeter & Bro., Inc.
- San Francisco, Los Angeles, Seattle: Harry W. Brintnall Co.
- Dayton: Seybold Factory
- Toronto, Montreal:
  Harris-Seybold-Potter (Canada) Limited
- London, England:
  Smyth-Horne, Ltd.
- Latin America and West Indies:
  National Paper and Type Co., Inc.

• The SEYBOLD PRECISION MILL TRIMMER is a business asset because it produces results that promote continued association between mill and customer.

Mill orders are filled with a degree of perfection which makes the product an asset to the buyer.

The trimming, halving or quartering of piles are always square, always precise with a SEYBOLD.

The SEYBOLD PRECISION MILL TRIMMERS will speed precision production, reduce operating expense and gain for you a greater portion of the printer market.

OTHER PRODUCTS BY SEYBOLD

Book Compressors • Book Trimmers • Cutting Machines • Drilling Machines • Knife Grinders • Die Presses • Round Corner Cutters • Stamping Presses • Wire Stitchers

SEYBOLD · DIVISION
HARRIS • SEYBOLD • POTTER CO. *Dayton, Ohio*

Canadian Mills May Step Up Production Soon

Newsprint Outlook Brighter As Reserve Stocks Are Being Depleted — Mills Expect To Increase Production 50 Tons Per Month By October — Ontario Co. Celebrates Silver Jubilee — Other Late Mill News.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ontario, September 7, 1938. — The Newsprint outlook is brightening and as reserve stocks are being depleted, the mills anticipate that by the end of September or early in October they will have to step up production by 50 tons a month. It is believed that this quantity will be required by American publishers.

Speaking of the general situation, the Financial Post says, "As a reflection the Canadian mills will undoubtedly show a fairly substantial operating profit for the last quarter of 1938. This does not mean that returns for the full year will be comparable with those reported in 1937. But it does mean that the financial statements will reveal that the majority, if not all, of the operators will cover their senior charges. There will be little, if anything, left over for capital stock as was the case last year.

The situation further is possible of improvement through a betterment in the American business trend. Should this happen, advertising will increase; reader interest widen; and, in turn, the use of newsprint paper advance. This would mean that the surplus reserve stock would be used up faster than now anticipated. However, the gain in this respect is to be taken cautiously, for even at the best the American newsprint consumption for 1938 will be at least 10% less than in 1937.

It is too difficult to be precise as to what will be the outcome for the balance of the year. However, the industry is almost definitely assured of a comparatively substantial increase in shipments during the last quarter.

Entering 1938 the industry should have no inventory problem. There should be close co-ordination between production, shipments and consumption. Whether the demand trend in 1938 will move upward depends, of course, on business in the United States. In any event the industry, and, in turn, the individual manufacturers will be in a stronger position at the beginning of 1939 than was the case at the beginning of 1938.

There is reason to believe at this juncture that the industry's returns for the last three or four months of 1938 will be sharp contrast to those that have been released to date this year.

The investor in Canadian newsprint securities will have to appraise these returns with care. They will be so much better relatively that they are apt to give rise to over-optimism.

It will not be possible to obtain a clear picture of the industry's position until the beginning of the year when conditions should be normal. Then production and shipments will bear a close relationship to consumption and the latter, in turn, will depend upon the course of business in the United States.

Ontario Paper Co. Celebrates Silver Jubilee

The Ontario Paper Co., Limited, Thorold, Ont., of which Arthur A. Schmon is president and general manager, is celebrating its silver jubilee. In the first week of September, 1913 it began to turn out one hundred tons of newsprint daily for its owners, the Chicago Tribune. For the period of twenty-five years, the Ontario Paper Co., has not sold any of its product to any other paper than the Tribune and in recent years the New York Daily News which is under the same ownership. An affiliated mill at Baie Comeau on the north shore of the St. Lawrence river was recently completed and put in operation.

Many interesting facts are revealed in the history of the Ontario Paper Co. When it started in 1913 newsprint was selling at $43 per ton and after the great war the price ascended to over $100 per ton. During the depression, the figure dropped as low as $40 and now it is $50. Twenty-five years ago unskilled labor was paid 20 cents and hour and today the same labor receives 54 cents. Electric power was $12 per horse power in 1913 and now it is $21. Taxes and all other costs have risen accordingly and skilled help receives from two to three times as much as in 1913. The company has come through the quarter of a century without any strikes in the mill and the number of employes today is 768 whereas in 1913 the full force was 226. The total wages paid including the woods department has been $50,000,000 and the annual average disbursement at Thorold has been $1,250,000. There are 23 employes who have served continuously throughout the twenty-five years and 100 for more than twenty years. The tonnage of newsprint produced up to the end of last month has been 2,338,821 tons. The daily average production of newsprint and mill wrappers is between 450 and 500 tons, ground wood pulp 380 tons and sulphite pulp 100 tons. The Ontario Paper Co., was built just after the removal of the duty on Canadian newsprint entering the United States. The reason for its construction, it is said, was that the owners of the Chicago Tribune of which Col. R. R. McCormick is the publisher, felt that they could not buy newsprint in the open market under the conditions then prevailing as favorably as could their principal competitor. The policy enunciated at the beginning not to manufacture the full newsprint requirements of the Tribune and its wholly owned affiliates has been adhered to throughout and this condition exists today, it is stated, despite the fact that the new Baie Comeau development has a rated capacity of 350 tons making 850 tons per day for the two mills—this plant and the one at Thorold.

Syndicate to Buy Abitibi Mill Dissolved

The syndicate of business men negotiating for the lease of the idle pulp plant of the Abitibi Power and Paper Co., Limited, at Sturgeon Falls, Ont., has been dissolved. The $10,000 subscribed by residents of Sturgeon Falls and North Bay is being refunded, according to H. B. Gibbs of Sturgeon Falls, chairman of the committee. He said that the operation of a ground wood pulp mill had passed from the possibility of public ownership to one of a strictly private nature.

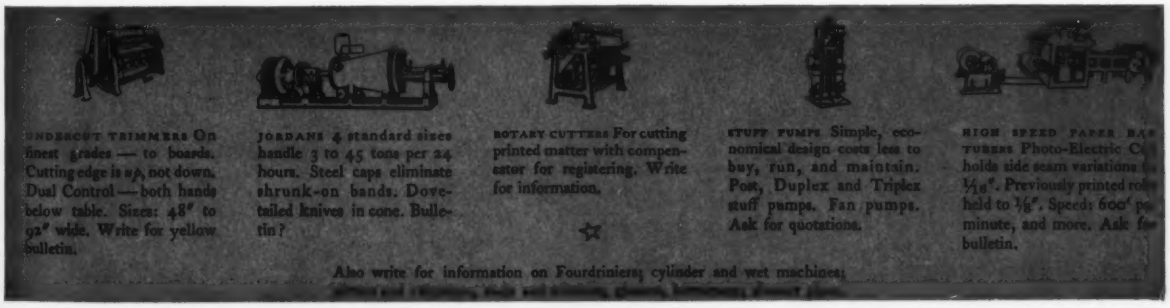
HE LOWERED HIS PRICE

but not his QUALITY

Calender cutting the uneven edges of his board was causing one of our customers such great losses that the cost of his paper had to be high. Some sources paid the price for it, true, but if he could have lowered that price—many new markets could have opened for him.

S. & W. engineers developed for this manufacturer a new calender feed that reduced his cutting losses from 25% to 1 or 2% . . . and the resulting savings enabled him to lower his price.

Write to us for more information on S & W paper machines which include straight Fourdriniers, and the Edwards and Harper type up to 130 inches wide. There is no obligation.



UNDERCUT TRIMMERS On finest grades — to boards. Cutting edge is up, not down. Dual Control — both hands below table. Sizes: 48" to 92" wide. Write for yellow bulletin.

JORDANS 4 standard sizes handle 3 to 45 tons per 24 hours. Steel caps eliminate shrunk-on bands. Dovetailed knives in cone. Bulletin 7

ROTARY CUTTERS For cutting printed matter with compensator for registering. Write for information.

STUFF PUMPS Simple, economical design costs less to buy, run, and maintain. Post, Duplex and Triplex stuff pumps. Fan pumps. Ask for quotations.

HIGH SPEED PAPER BA[G] TUBERS Photo-Electric C[ontrol] holds side seam variations to 1/16". Previously printed rolls held to 1/8". Speeds 600' per minute, and more. Ask for bulletin.

Also write for information on Fourdriniers; cylinder and wet machines;

The SMITH & WINCHESTER

Manufacturing Company

1828

ONE HUNDRED AND TEN YEARS OF ADVANCEMENT

PLANT AND OFFICES AT SOUTH WINDHAM, CONN.

Increased Orders Buoys Up Chicago Market

Broader Demand and Larger Quantity Orders Encourages Mid-West Wholesale Paper Trade Which Report Prices Hold Steady — National Paper Trade Association Reports Convention Plans Near Completion.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., September 12, 1938.—A marked increase in retail business, estimated at 9 per cent, coming immediately following Labor Day, was the only definitely bright spot in the local market this week. However, the general improvement in tone was sufficient to bolster up the paper market and to carry more conviction to the statements that demand, in general, was improved. The slow strengthening process is being held back by war scares and fears of Congressional action but there are many market commentators locally who believe the paper market is in a more sound position, basically, than it has been for some time.

Prices Reported Steady

Prices are indicated as steady and facing a likelihood of increases rather than of any breaking. Demand has broadened out and the size of orders is improved. Book papers assumed a more active position during the week as did covers while the entire bond market was developing a stronger tone in anticipation of materially increased business. Krafts, buoyed up by a marked evidence of stability, found the going better during the week as did groundwoods where an increase in orders was reported as noticeable. Newsprint markets did little during the week with the board market also evidencing little change. The most disappointing statement came from the waste paper market where an increasing evidence of softness is reported. Local waste paper dealers feel that the reaction is only a normal one after the spurt from the extreme lows of a few weeks ago.

M. & O. Moves To Opera Building

The Civic Opera Building at 20 N. Wacker Drive makes another bid for paper headquarters honors with the recent announcement that the Minnesota and Ontario Paper Company has located Chicago offices in that building. The central location of the building was the deciding feature according to R. O. Warner, manager of merchant sales, who also announced that additional printing grades will be marketed through Chicago, necessitating a more close contact with customers in Chicago.

Complete Plans for N. P. T. A. Sessions

Plans are about completed for the fall meeting of the National Paper Trade Association scheduled for the Stevens Hotel, Chicago, September 18 to 21. Each of the participating associations have announced special programs with the Salesmens Association golf outing as their feature; the appearance of Jimmy Gheen as the headliner of the Paper and Twine Club at another and a real series of comprehensive business sessions as the basic purpose of the three day program. Meanwhile, many exhibitors have been publicizing, either by direct mail or news release, the features of their displays on the special exhibit floors of the big Chicago hotel. Some of the displays are going to be entertaining as well as instructive. The Central Paper Company, for example, has publicized the appearance of Ray Conlin, well known ventriloquist, who is going to give the central mechanical display figure a real voice. Local paper executives expect the Fall session to be one of the most outstanding from the standpoint of program and attendance yet held. Further, the Exhibits Committee announces that the displays will outdo those of last year both from the standpoint of number and genuine quality. Every step has been taken to make the event a constructive and enjoyable affair. It's no wonder that paper men the country over are now saying, "See you in Chicago September 18."

Paper & Twine Club Plans for Fall

The Paper & Twine Club will make Chicago its headquarters on August 23 when the advisory committee meets at the Blackstone to further develop the specific program of activity of the organization. It is reported that many suggestions for a constructive procedure have been received since members were urged to make suggestions and it will be the job of the advisory committee to assemble these suggestions into a comprehensive report to be made at a meeting of the general group. This latter meeting is scheduled for September 18 during the sessions of the National Paper Trade Association at which Jimmy Gheen, nationally known humorist, is to be the headline speaker.

Jim Danehy to Visit Europe

Chicago paper men will have to do without the smiling face of Jim Danehy for awhile as the vice president and general manager of the Schwarz Paper Company plans to sail for Europe on October 1 to visit Germany, Hungary, Austria and other points in the thick of the present headlines over the war scare. Not only does Mr. Danehy plan to tempt the war fates with a restful vacation but he is also reported to be on the lookout for any improved methods of merchandising paper while visiting the various countries of Europe.

All-America Packaging Competition

A large number of Chicago concerns, in cooperation with advertising agencies, printers and, in some cases, paper houses, are evidencing real interest in the 1938 All-America Package Competition which has recently been opened. There are to be twenty classifications for the 1938 competition including folding cartons, collapsible tubes, fibre cans, set-up paper boxes, shipping containers, opaque wraps, bags and envelopes, labels and seals and rigid transparent containers. These are practically the same as the 1937 classifications except for a breakdown in the display classifications and a combing of the bag, envelope and wrapping groups. The competition is to close on December 15, 1938, and the trophies will be officially presented at a banquet probably to be held in New York City in March.

SEMCO LININGS

Hollow Tile Tank

Hewett Construction

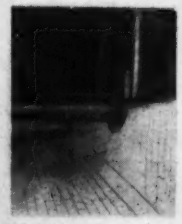
Concrete Tile Tank

SEMCO ARE

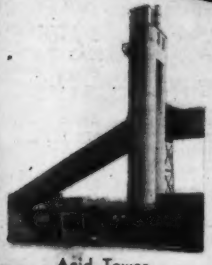
Digester

Accumulator

SEMCO


Tile Lined Beater

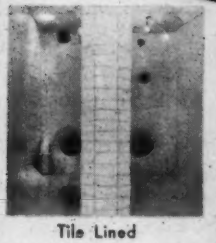
BETTER LININGS


Acid Tower

Brick-lined Concrete Acid Storage Tank

FOR EVERY NEED

Washer Vat Under Construction


Tile Lined Storage Chest

SEMCO

Stebbins Engineering and Manufacturing Company

WATERTOWN, NEW YORK

Donnahue Gets Scripps-Howard Contract

Order To Supply 40,000 Tons of Newsprint Per Year Goes To Donnahue Bros. First of New Year — Change Creates Discussion — St. Lawrence Paper Co. Director Says Lost Tonnage Will Be Replaced—Other News.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., September 12, 1938—Some discussion is taking place here as to whether or not there has been a concession in the matter of price for the supply of newsprint to the Scripps-Howard interests.

Some time ago a contract for the supply of some 40,000 tons of newsprint per annum to this American firm was placed with Donnahue Bros., Ltd., who have a mill at Murray Bay, equipped with two 153 inch fourdriniers, the widest trimmed sheet capacity being 146 inches.

New Contract Creates Discussion

The contract takes effect at the beginning of the new year, on the expiring of the present contract with St. Lawrence Paper Mills. The suggestion is that this company declined to make any concession on the $50 a ton price fixed by the major newsprint producers, and the question now being discussed is whether or not a concession has been made by the independent firm to whom the contract has been switched. Commenting on the subject the Montreal Gazette says: "The Quebec Government's attitude in this matter of price is well known; hence the interest in the suggestion that one unit, however small, has negotiated a contract at a price lower than that of the major companies. Whether or not such a concession in price has been made could not be confirmed in official quarters. Regarding the position of St. Lawrence, it is said that compensating tonnage will be provided from 'pool' account, and regarding the price structure generally it is said that the policy of the major producers remains unchanged."

The Financial Times of Montreal says: "It is pointed out that, apart from the promise of a fairly sharp upturn in newsprint demand during the final quarter of this year, which would give St. Lawrence an opportunity to replace to some extent the Scripps-Howard tonnage, the company would hardly have let a contract, which represents about 50 per cent of its current production, slip out of its fingers—even if some price concession were necessary—unless the support and co-operation of other major producers were assured. A director of the company, in conversation with The Financial Times, said he was not worrying about the 1939 prospects for the company. The Scripps-Howard tonnage will, he said, be replaced. The development is looked upon as a constructive one in newsprint circles as providing further evidence of the solidarity of the industry, as represented by the major producers, on the price question."

Indian Market for Wood Pulp

Attention is drawn to India as a market for wood pulp by Paul Sykes, the Canadian Trade Commissioner in Calcutta. During the past six years, he states, imports have amounted to from 11,000 to 20,000 tons per month. During 1937-38 total imports amounted to 214,334 cwts., valued at Rs. 1,717,076. (One rupee is approximately equal to $0.375 Canadian). Norway, Sweden and the United States, in the order named, were the principal sources of supply.

Imports from Canada have been spasmodic. There is no record of imports of Canadian wood-pulp during the year 1932-33, but a limited volume of business was done during the next three years, values having been as follows: 1933-34, Rs.34,643; 1934-35, Rs.27,598; 1935-36, Rs.58,772. Again in 1936-37 no business was done by Canadian firms, but shipments were resumed during the latter part of 1937, while a cargo valued at Rs.23,654 was cleared through the Calcutta customs early in the present year. He adds:

"The market is based almost entirely on the demand of the paper manufacturing industry for materials to blend with pulp made locally from grass and bamboo. It is only for the manufacture of some types of paper that foreign wood-pulp is required, numerous grades being made only from indigenous materials. The technique of manufacturing average qualities of writing and similar papers exclusively from pulp of domestic origin is gradually improving and, as further refinements are introduced, the demand for foreign pulp will possibly decline. For the time being, however, the construction of several new paper-mills may conceivably lead to an increase in wood-pulp imports.

"The principal types of wood-pulp now in demand are bleached and easy bleaching sulphite, the latter being required in larger quantities than the former. Sulphate pulp is seldom purchased by Indian paper-mills, although one plant now in the course of construction will probably provide an outlet for the grade up to the time when adequate stocks can be produced from domestic materials. Small amounts of bleached sulphate are occasionally imported by boxboard manufacturers.

"Wood-pulp is usually purchased in London, contracts being concluded on a basis of specifications and prices or following analysis and testing of samples at the mills in India.

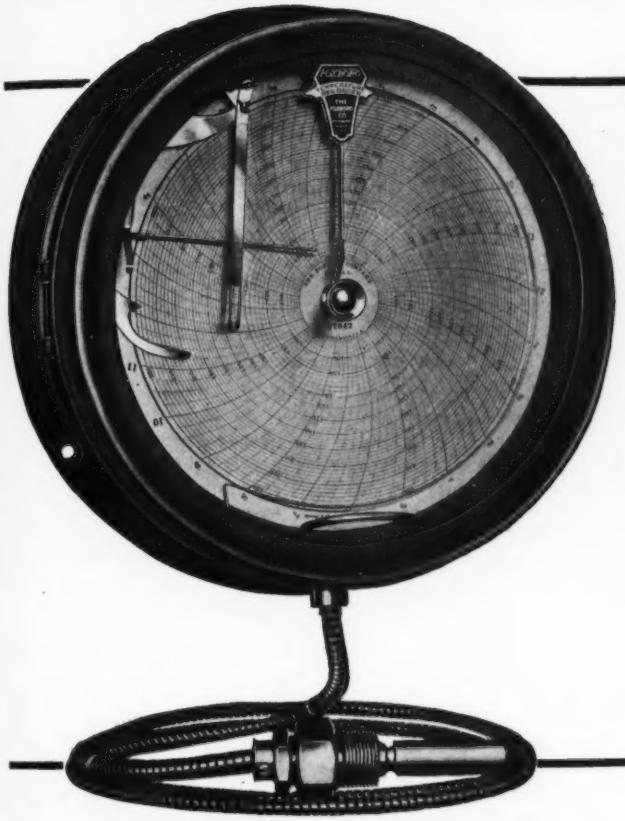
Lumberjacks Seek Increased Wages

At a convention of delegates from forestry regions of the Province in Baie Comeau, Que., it was decided to place before the Quebec Fair Wage Board demands for increased wages for lumberjacks. They ask a monthly minimum wage of $52, with board and lodging for woodsmen. The rate is seven dollars above the minimum of $45 set down by provincial legislation. They also ask that, starting April 1 next, wages of log drivers be fixed at $3.50 a day for a day of 10 hours, with 40 cents an hour for overtime and double-time for work on Sundays and feast days. The resolution demands 40 cents an hour for log-drive dynamiters and boatmen.

The delegates requested a minimum allowance of $25 monthly for each horse, sleigh and harness, used in the shanties, in addition to free fodder for the animals.

25 GOOD REASONS

for using Foxboro *mono-therm* thermometers



SO_2 Gas Cooler Temperature—entering and leaving
SO_2 Reclaiming Tower Acid Temperature
Relief Cooler Temperature—water entering and leaving
Digester Temperature
Bleach Dissolving Temperatures
Bleach Tank Temperature
Beater Temperature
Dryer Temperatures
Dry Loft Temperatures
Bellmer Bleaching System
Acid Tower
Slaked Lime Tank
Temperature of Pulp Slush
Waste Liquor
Brine Tank
Sulphate Digester
Bleaching Tanks
Bleaching Hollanders
Glue Kettles
Color Mixers
Paste Temperatures and Size Cooking
Dryer Temperatures
Drying Ovens
Tanks with stock or water
Wax Vats for wax paper coating

Proof from the field of truly outstanding performance is the best reason for using any instrument. Here are 25 reasons . . . 25 applications of Foxboro Recording Thermometers where the unequalled life, accuracy and response have proved their economic value.

Users know that vibration, shock or overrange temperature cannot cause loss of accuracy in the modern *mono-therm* system. The permanently-sealed actuating unit has been made into one integral piece of metal. Friction and inertia are practically eliminated by the light – yet strong – moving parts. Sturdy, fixed parts assure permanent alignment. Lost motion is banished!

You can profit by using Foxboro *mono-therm* Recording Thermometers. Every *mono-therm* unit is *certified* by Foxboro. Write for Bulletin 198–1. The Foxboro Company, 114 Neponset Avenue, Foxboro, Mass., U.S.A. Branch Offices in 25 Principal Cities.

FOXBORO

REG. U. S. PAT. OFF.

mono-therm RECORDING THERMOMETERS

News of the Philadelphia Paper Market

Paper and Cordage Association Hold Fall Meeting On September 16 — Paper Merchant Members To Attend 50th Anniversary of Typothetae — Philadelphia Representatives At N. P. T. A. Convention In Chicago.

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., September 12, 1938—The September meeting of the Philadelphia Paper & Cordage Association will be held at the Adelphia Hotel on Friday, September 16th with luncheon at 12:30 o'clock. In line with the new policy recently outlined at a directors' meeting by President Joseph H. Miller, there will be an educational program which will have its inception at this meeting. A moving picture of the processes employed in one of the southern mills of the Union Bag & Paper Company will be shown by Mr. Hawley of that company, who has agreed to exhibit this picture, which has already aroused considerable interest and favorable comment wherever it has been shown.

In furthering this idea of educational work, an invitation has been extended to all members of the Association to present educational subjects regarding their particular business, and it is expected that future meetings will be devoted to an increasingly large extent to the hearing and seeing first hand what is new in the paper and cordage industry.

Last Golf Tournament September 28

The final golf tournament of the 1938 season will be held at the Philadelphia Country Club on Wednesday, September 28th. Over a path to glory studded with yawning traps and treacherous greens that have stopped some of the world's masters, some one hundred paper and cordage golfers will trudge the championship Spring Mill Course. There will be prizes for the usual good performance in addition to a number of kickers handicap awards. The final rounds for the possession of the Buffalo Envelope Trophy will be played. The trophy, a large silver cup, will be awarded to the player who, throughout the summer tournaments, has compiled the lowest net score. The field will be littered with perhaps the finest group of golfers, and anything can happen.

Paper Merchants to Attend Typothetae

Prominent paper merchants here who are members of the Typothetae of Philadelphia are planning to attend the 50th anniversary of the granting of a charter to the Typothetae of Philadelphia by the United Typothetae of America, in Franklin Memorial Hall, Franklin Institute, on Thursday, September 29th. The charter, signed by Theodore L. DeVinne, then president of the U.T.A. is dated September 1888 and hangs on the wall of the Board room. Of course, there was a printer's organization before that time but it was not entitled to use the name Typothetae until the charter was granted. The first association of printers of which there is any record, was organized in 1835, and was known as the Employing Printer's Association. E. Lawrence Fell, a past president of the Typothetae of Philadelphia and honorary member, and also a past president of the United Typothetae of America, will be toastmaster on this auspicious occasion. Following the dinner, which will be accompanied by music, the presentation of medals to all living past presidents of the Typothetae of Philadelphia, and the presentation of membership certificates to all members, with gold seals for those having been members for fifty years, and silver seals for those having been members for twenty-five years or more, will take place.

Philadelphia Men at N.P.T.A. Meeting

W. B. Killhour, president of the Paper Trade Association of Philadelphia, accompanied by LeRoy S. Bishop, treasurer of Raymond & McNutt, will leave for Chicago on Saturday next to attend the National Paper Association Convention. Mr. Killhour will represent the fine paper division and Mr. Bishop the wrapping paper division of the Paper Trade Association of Philadelphia.

Waterproof Paper Lacquer

The new waterproof lacquer for paper which has been announced here by E. I. du Pont de Nemours & Company is intended for use as a protective film on packages, as the new lacquer is said to be impermeable to water vapor. It is resistant to scuffing and scratching and can be made to resist alcohol, grease and other reagents. Offsetting and smearing of inks on labels of products, which must be packaged while hot, are prevented by its use, it is claimed.

"Twinkle Twix" Luminous Paper

Manufacture of "Twinkle Twix" products—an assortment of stars and planets that assume a luminous appearance in darkened rooms, has been started by the Luminous Novelty Company, now located on the Orchard Beach Road, North East, Erie, Pa. Claiming to be the only factory of its kind in the world, the new North East plant's "heavenly bodies" are made of thin, white paper, coated with a glowing paint that retains its peculiar properties for years, George W. Wallace, the manufacturer, says.

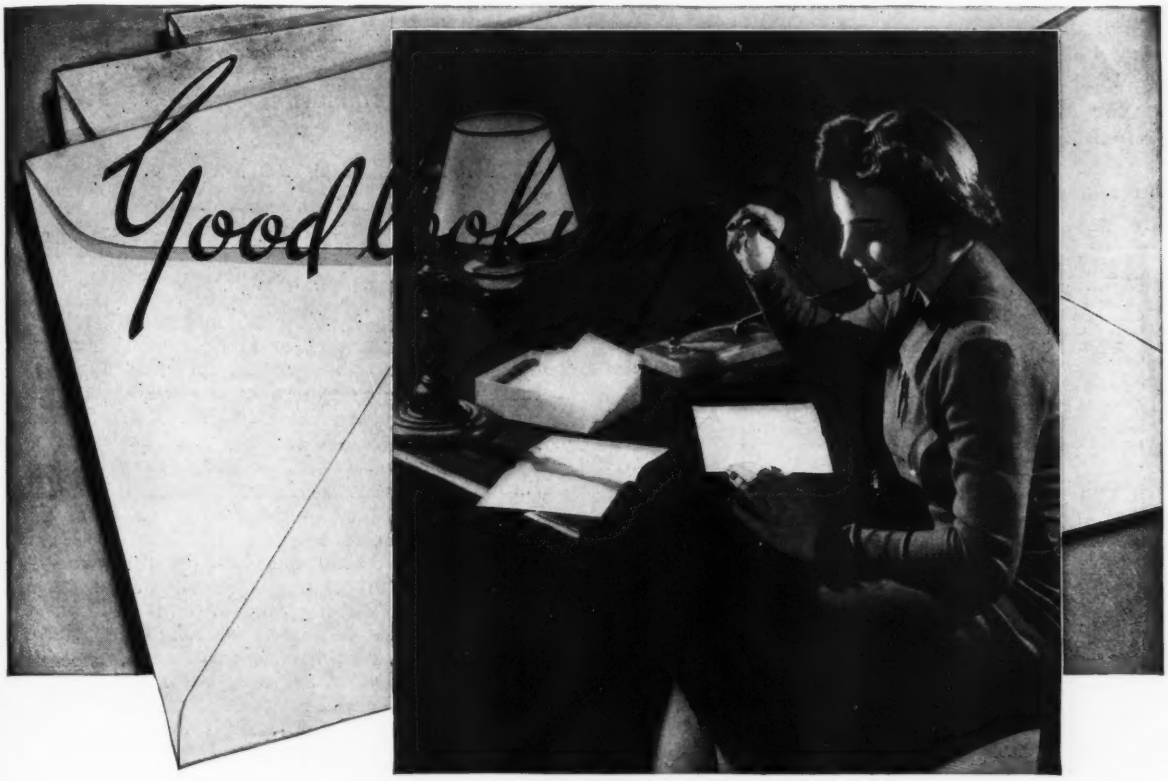
Form Paper Mills Service Co.

John M. Connor of Philadelphia and John D. Abbatemarco of Brooklyn, announce, as of Sept., forming the Paper and Board Mills Service Company, 109-127 Second avenue, Brooklyn, N. Y.

Mr. Abbatemarco, president of the Abbatemarco Trucking Corporation, a former member of the famous 1930 track and football squad of the University of Notre Dame, is the son of James Abbatemarco who has been reputably identified with the paper stock trade in Brooklyn for more than 35 years.

Mr. Connor has been connected with the paperboard industry for the past 25 years; recently as vice president of Delaware Paper Mills, Inc., Wilmington, Del., and formerly an executive with the Philadelphia Paper Manufacturing Company, (now Container Corporation of America) Manayunk, Philadelphia, Pa., and later with the Fibreboard Products, Inc., San Francisco, Ca., as Eastern district manager. The new company, whose 'phone address is South 8-5160 and 5161, will specialize in the sale of paper board, waste materials and mill equipment.

OPACITY · WHITENESS · BRIGHTNESS



ENVELOPE STOCKS

require OPACITY, WHITENESS and BRIGHTNESS such as Titanox pigments give

Envelope makers report an interesting revival in demand for better envelopes—made from stocks which are completely opaque and brilliantly white. How to meet this demand without increasing weight is a problem for paper manufacturers.

But it really is not much of a problem because Titanox pigments have solved it already. The exceptional opacity, whiteness and brightness of these pigments permit the production of light weight papers with a minimum of show-through, with desirable whiteness and brightness, and with fine texture. Only a small loading is required, leaving the strength of the paper unimpaired.

Titanox pigments are chemically inert, have small particle size and are readily dispersible, all of which makes for easier working.

For LIGHT WEIGHT Stocks

TITANOX-A gives the best results in papers where low ash and high strength are of primary importance. It is pure titanium dioxide, the most opaque and whitest white pigment obtainable. It gives desired results with low pigmentation.

For HEAVIER Stocks

TITANOX-B-30 (Titanium Barium Pigment) is effective and economical in papers which permit higher pigment loading. It contributes to opacity, color and brightness without increasing weight.

Our Technical Service Department will be glad to show you how these modern pigments will benefit your envelope stocks.

TITANIUM PIGMENT CORPORATION

Sole Sales Agent

111 Broadway, New York, N. Y.; Carondelet Station, St. Louis, Missouri; National Lead Company (Pacific Coast Branch) 2240 24th Street, San Francisco, California

TITANOX

TRADE MARK

Financial News of Pulp and Paper Industry

Puget Sound & Timber Reports Profit of $21,142 For Six Months Ended June 30 — Wisconsin Mills Doubtful Regarding PWA Loans—Palouse Pulp & Paper Ordered Dissolved—Detroit Paper Products Shows Loss.

NEW YORK STOCK EXCHANGE

High, Low and Last for the Week Ending September 14, 1938

	High	Low	Last
Armstrong Cork Co.	45½	39	39¼
Celotex Corp.	24½	18	19⅜
Celotex Corp., pf.	65	64⅛	64⅛
Certain-Teed Products Corp.	10½	7⅛	8⅜
Certain-Teed Products Corp., pf.	42	33	34
Champion Paper & Fibre Co.	24	19	19
Champion Paper & Fibre Co., pf.	96¼	96¼	96¼
Congoleum-Nairn Co.	27⅞	23	23¾
Container Corp. of America	15¾	12¼	12⅜
Continental-Diamond Fibre Co.	9¾	8	8
Crown-Zellerbach Co.	12⅞	9½	10⅛
Crown-Zellerbach Co., pf.	80½	76½	76½
Flintkote Co.	25⅝	19⅞	21⅛
Robert Gair	4½	3½	3½
Robert Gair, pf.	13⅜	13⅜	13⅜
International Paper & Power	9¾	6¾	7⅜
International Paper & Power, pf.	42	32	34⅜
Johns-Manville Corp.	100⅝	90⅛	94½
Kimberly-Clark Corp.	26	26	26
Masonite Corp.	56	50¼	50⅜
Mead Corp.	13½	10½	10½
Mead Corp., pf.	10¾	9⅜	9⅜
Paraffine Companies, Inc.	47½	43	43
Ruberoid Co.	28½	24⅛	24⅛
Scott Paper Co.	47¾	46¼	46¼
Sutherland Paper Co.	30¼	26⅜	27
Union Bag & Paper Corp.	13½	10	10½
United Paperboard Co.	7⅜	5¼	5½
U. S. Gypsum Co.	100½	92½	94½
U. S. Gypsum Co., pf.	168	168	168

NEW YORK CURB EXCHANGE

High, Low and Last for the Week Ending September 14, 1938

	High	Low	Last
American Box Board Co.	9½	8⅞	8⅞
Brown Co., pf.	24	18	18
St. Regis Paper Co.	3⅛	2⅝	2¾
Taggart Corp.	5⅜	4⅝	5⅛

Puget Sound Shows Small Profit

The Puget Sound Pulp and Timber company report for the six months ended June 30, 1938, shows profit of $21,142 after all prior charges except depreciation, obsolescence and provision for income taxes. No figures were released for 1937 first-half operations.

For the full year 1937 the company's net profit was reported as $254,998 after all prior charges and production totaled 63,337 tons and sales 59,480 tons. For the first half of 1938 the company produced 11,687 tons of unbleached sulphite pulp and sold 11,382 tons. Sales in June totaled 3040 tons, or at a rate considerably in excess of the first-half average.

Recently a new plant was completed by the company at Bellingham, adding 40,000 tons to its annual production capacity and bringing the total to 105,000 tons yearly. This new plant was financed by the sale of an issue of preferred stock.

There are now 123,637 shares of $1.20 cumulative preferred outstanding, on which annual dividend requirements total $148,364, or $37,091 quarterly. The common is not on a dividend basis.

C. S. Sales Heads Detroit Paper Products

Seymour H. Franklin, former president, has been elected chairman of the board of the Detroit Paper Products Corporation and C. Stanley Sale, a director, has been elected president.

P.W.A. Loans To Paper Mills

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., September 12, 1938—P.W.A. finances with which paper mills of the Wisconsin River Valley were hoping to increase their power sources and improve water flow appear to be in doubt, on the basis of statements by Administrator Harold L. Ickes. This situation came to light when smaller projects in Wisconsin were not receiving approval because of the state's application for $26,000,000 for the new power plants, dams and reservoirs desired by the Consolidated Water Power and Paper Company and others through the proposed Wisconsin Hydro Authority.

Gov. Philip F. La Follette, who was a leader in the movement to obtain a grant of $11,300,000 and a loan of $14,700,000 has brought pressure on P.W.A. officials to continue approving the smaller applications now on file from various Wisconsin cities. He contends, however, that Wisconsin's share of the federal funds is sufficient to take care of the grant and the smaller projects, but Administrator Ickes made an unofficial statement that the $26,000,000 project would have to wait if the others were granted, because the state's allotment would be exhausted.

Efforts are still being made, however, to obtain early approval so the work can be started this fall.

Palouse Paper Co. Ordered Dissolved

[FROM OUR REGULAR CORRESPONDENT]

CALFAX, Wash., September 10, 1938—Dissolution of the Palouse Pulp and Paper company, organized about 10 years ago for the manufacture of paper from straw and other materials, was ordered in superior court here. Allen Lamphere, appointed receiver on petition filed in April, 1937, had a balance of $425 on hand after claims of creditors and attorney fees had been paid, which is to be applied on the state's claim of $1010 for license tax.

Capitalization for 15,000 shares of preferred stock at $10 a share, $9026 was sold, all but $447 of which, coming to the receiver, was used for promotion. Common shares, 15,000 of no par value, were given to H. D. Wagon for a patented formula for the manufacture of paper.

Detroit Paper Products Reports Loss

The Detroit Paper Products Corporation reports as follows for the six months to June 30: Net loss, $60,732 including $16,007 reduction in valuation of raw material inventories. Last year there was a net profit of $86,271, which equaled 41 cents each on 210,000 common shares. Seymour H. Franklin, formerly president, has been elected chairman of the board and C. Stanley Sale, a director, has been made president.

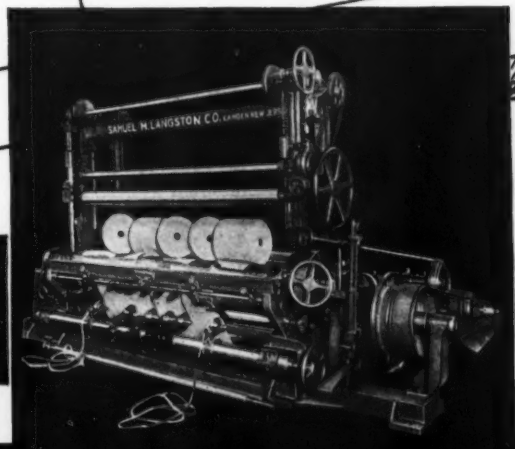
ANGSTON LITTERS AND ROLL WINDERS

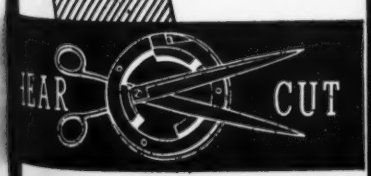
SQUARE

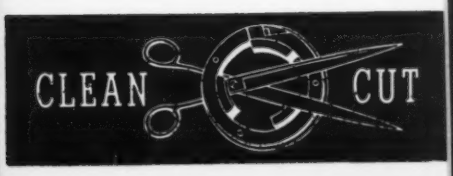
Every Langston Slitter and Roll Winder is built up, part by part, on a heavy bedplate. Squarely aligned, the machine will turn out firm, square-edged rolls over long periods with a minimum of maintenance.

There is a type and size for every need.

SAMUEL M. LANGSTON COMPANY
CAMDEN, N. J.







Government Paper Bids and Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., September 14, 1938—The Government Printing Office has received the following bids for 61,000 pounds (500,000 sheets) of 28 x 34 white sulphite writing paper; Cauthorne Paper Company, 5.69 cents; Whitaker Paper Company, 5.33 cents; Graham Paper Company, 5.96 cents; Stanford Paper Company, 5.5 cents; Barton, Duer & Koch Paper Company, 5.528 cents; Marquette Paper Company, 5.57 cents; R. P. Andrews Paper Company, 5.338 cents; Aetna Paper Company, 5.49 cents; Mathers-Lamm Paper Company, 5.32 cents; Paper Corp. of U. S., 5,527 cents; and Mudge Paper Company, 5.33 cents.

For 31,500 pounds (300,000 sheets) of 26 x 32 white offset book paper; Bradner & Smith Company, 5.5 cents; Mudge Paper Company, 5.52 cents; Butler Company, 5.85 cents; Aetna Paper Company, 5.54 cents; Marquette Paper Company, 5.34 cents; Graham Paper Company, 5.62 cents; Walker, Goulard, Plehn Company, 5.77 cents; Whitaker Paper Company, 5.48 cents; John F. Post, Inc., 5.77 cents; Paper Corp. of U. S., 5.77 cents; R. P. Andrews Paper Company, 5.77 cents; Barton, Duer & Koch Paper Company, 5.67 cents; Old Dominion Paper Company, 5.58441 cents; Mathers-Lamm Paper Company, 5.62 cents; and Stanford Paper Company, 5.76 cents.

For 37,500 pounds (1,500,000 sheets) of 21 x 32, 50 per cent rag, white manifold paper; Marquette Paper Company, 16.47 cents; R. P. Andrews Paper Company, 16.63 cents; Whitaker Paper Company, 16.62 cents; Stanford Paper Company, 17.51 cents; Cauthorne Paper Company, 16,788 cents; Barton, Duer & Koch Paper Company, 16.59 cents; Mudge Paper Company, 16.79 cents; and Walker, Goulard, Plehn Company, 17.15 cents less 1 per cent.

The Printing Office has announced the following paper awards;

Mudge Paper Company will furnish 40,000 pounds of yellow sulphite writing paper in 32 inch rolls, at 5.34 cents; Stanford Paper Company will furnish 13,400 pounds (100,000) sheets) of 38 x 48 blue M. F. book paper at 6.5 cents; and the Mudge Company will also furnish 2,400 sheets of 22 x 28 mist gray photo mount board at $41.56 per M sheets. Bids for these items were received on August 29.

R. P. Andrews Paper Company will furnish 145,-350 pounds (1,150,000 sheets) of various size white M. F. book paper at 5.14 cents, bids for which were received on August 24.

Aetna Paper Company will furnish 28,050 pounds (300,000 sheets) of 32 x 42 white sulphite writing paper at 5.91 cents, bids for which were received on August 22.

Cauthorne Paper Company will furnish 48,000 pounds (200,000 sheets) of 38 x 50 supercalendered book paper at 5.38 cents, bids for which were received on August 19.

Aetna Paper Company will furnish 13,224 pounds (87,000 sheets) of 29 x 41, 50 per cent rag, white ledger paper at 9.09 cents; Walker, Goulard, Plehn Company will furnish 77,000 pounds (500,000 sheets) of 38 x 48 M. F. book paper at 5.36 cents; Whitaker Paper Company will furnish 750 sheets of 21 x 32 pink gummed paper at $17.67 per M sheets; bids for all of these items were received on August 17.

Mudge Paper Company will furnish 29,100 pounds (150,000 sheets) of 20 x 30 drumhead manila paper at 14.85 cents, bids for which were received on August 12.

Cauthorne Paper Company will furnish 1,000 pounds of white stereotype molding paper at 11 cents and the same firm will furnish 1,000 pounds of same red at 14 cents; R. P. Andrews Paper Company will furnish 520 pounds (2,000 sheets) of 26 x 40 buff antique cover paper at 18.25 cents. Bids for these items were received on August 8.

John F. Post, Inc., will furnish 77,000 pounds (1,000,000 sheets) of 24 x 38 M. F. book paper at 5.39 cents; Mathers-Lamm Paper Company will furnish 5,000 pounds of No. 1 gummed kraft paper in 24 inch rolls at 7.8 cents. Bids for these items were received on August 5.

Mathers-Lamm Paper Company will furnish 5,000 pounds of oiled manila tympan paper in 48 inch rolls at 7.5 cents, bids for which were opened on August 1.

Russell Products Company will furnish 500 pounds of facing stereo tissue paper in 24 inch rolls, at 83 cents per pound, bids for which were received on July 20.

Valley Iron Works Announces Change

The Valley Iron Works Company, builders of machinery for paper and pulp mills, Appleton, Wis., has closed its New York office which was formerly at 350 Madison avenue.

Harry Bennett, who has represented the company in the east for the past 16 years, is, however, still with the company and will handle the eastern business from his post office address which is as follows:—Harry Bennett, 12 McKinley street, Bronxville, Westchester County, New York, N. Y.

Changing conditions, it is stated, has influenced the company to take this step. The new arrangement calls for Mr. Bennett's covering the entire eastern territory much more fully than heretofore, as a consequence of which he will be in New York very little, although, of course, it will require that he contact the trade at regular intervals.

New Collapsible Paper Tube

A patent, No. 2,108,689, has been granted to Hugo Mock, New York City, on a novel form of collapsible tube, in which the body may be made of waterproof paper, cellophane, pliofilm or other water resistant materials.

The obstacle to making collapsible tubes out of materials other than metal hitherto has been the difficulty of joining the head and body of such a tube, which apparently is overcome by the new device.

Owing to the scarcity of metals in Germany, attempts have been made to provide substitutes for collapsible tubes, but so far, such substitutes do not appear to have proved successful.

The Nu-Tube Company, 10 East 40th Street, New York, is engaged in exploiting the device which is likely to provide new markets for paper and similar materials.

"The Harvesters" by Pieter Bruegel the Elder

"The Harvest Does Not Come of Itself"

THE PUSEY AND JONES CORPORATION, WILMINGTON, DELAWARE

Obituary

Herbert E. Westervelt

Herbert Eugene Westervelt, 79, president of the Gulf States Paper Corporation, Tuscaloosa, Ala., and well known resident of South Bend, Ind., died September 3, at his home at 527 North Lafayette boulevard. Death was attributed to a heart attack.

Having suffered a heart attack three years ago, Mr. Westervelt recovered and since that time traveled around the world.

Born on November 20, 1859, in Oskaloosa, Ia., Mr. Westervelt came to this city in 1894 from Mechanicville, N. Y. He was married in 1891 to Emma Neilson, who survives. Also surviving are a daughter, Mrs. Mildred Warner, Tuscaloosa, and four grandchildren, and three brothers, W. D., Honolulu, Hawaii; George, Oberlin, O., and Edwin C., Corpus Christi, Tex.

Thomas A. Weldon

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., September 12, 1938—Thomas A. Weldon, a leading paper manufacturing executive, passed away at his home in Thorold, Ontario, on September 3, in his eighty-fifth year after an illness of three weeks. He was vice president of Provincial Paper, Limited, and was also a director of the Interlake Tissue Mills Co., Ltd. For over a quarter of a century Mr. Weldon was manager of the Toronto branch of the E. B. Eddy Co., Hull, Que. Subsequently in association with his brother, the late Isaac H. Weldon and a group of Kalamazoo, Mich., papermen, the Montrose Paper Mills at Thorold, were taken over, of which Mr. Weldon became president. The plant was later acquired by Provincial Paper, Limited, who also have mills at Port Arthur and Mille Roches, Ont. Mr. Weldon was born in Cartwright Township, West Durham, and in his early life followed farming. His wife predeceased him several years ago. Surviving are one daughter, Mrs. W. H. Holland, Thorold, Ont., a brother, William Weldon, London, Ont., and three sisters. The passing of Mr. Weldon, one of the best known and best liked papermen in Canada, will be greatly regretted. Until a few weeks ago he made regular calls upon old customers in Toronto and vicinity and his visits were always welcome. His brother, the late Isaac H. Weldon, was a former president of the Canadian Pulp and Paper Manufacturers' Association.

John Matthews, Jr.

WASHINGTON, D. C., September 14, 1938—John Matthews, Jr., former Assistant Director of Foreign and Domestic Commerce, Department of Commerce, who died a few days ago in Westchester County, New York, was buried at Fort Lincoln Cemetery here last week.

Mr. Matthews will be recalled by the paper industry as having been chief of the paper division of the Department of Commerce from 1922 to 1925, at which time he became assistant director of the Bureau.

During his incumbency, he planned and supervised the construction of a national network of district offices for the Bureau of Foreign and Domestic Commerce, at the same time directing the activities of the special service divisions of that organization.

Following his retirement from the government service in July 1933, he joined the staff of Stevenson, Jordan & Harrison, multiple trade association executives of New York City. Before entering government service he spent many years abroad, principally in Latin America, as foreign representative of American paper manufacturing companies.

During his period of service with the federal government in Washington, Mr. Matthews resided in Chevy Chase, Maryland. He is survived by a wife and two children.

George F. Larcom

George F. Larcom, 63, purchasing agent for the Hollingsworth and Whitney Paper Company, Boston, Mass., for 40 years, died September 4 at his home, 44 Putnam street, West Newton, Mass. Funeral services were held September 6 at 2 o'clock at the home followed by burial in Central cemetery in Beverly.

A native of Beverly, he had been a resident of Newton for 25 years. He leaves a son, Russell Larcom of De Land, Fla., and three daughters, Mrs. Morgan S. Hurley and Mrs. Homer T. Brown of Newton and Mrs. Ward Dayton of Wilmette, Ill.

To Present Aldine Award

The Aldine Award, established in 1936 by Harry E. Gould, president of the Aldine Paper Company, and presented each year to the two juniors with highest scholastic standing in the Department of Printing, Carnegie Institute of Technology, was this year won by Ralph Ives of Topeka, Kan., and Joseph E. Barnes of Rochester, N. Y.

It has long been the desire of paper men to promote a better understanding between the paper and printing fields and Mr. Gould, in establishing this Aldine award, hoped to stimulate interest and create an incentive toward greater accomplishment in these young printing students. From information received, this award has proved a great factor in promoting progressive and constructive work among the students.

With the great strides that printing has made in the last few years, the necessity for encouraging printing education has increased and paper merchants are realizing more and more the importance of such education to the printing and paper industries. The Aldine Paper Company, in common with other progressive paper merchants, is interested in this development of the printing industry, since it is so closely related with the creating of beautiful and distinctive papers, which is its specialty.

Formal presentation of the award will be made this fall, when the students return to school to complete their senior year. First prize of a cash award and a bronze medal will be presented to Ralph Ives and a second cash award will be given to Joseph Barnes.

John F. Wilson Resumes Position

BOSTON, Mass., September 6, 1938.—John F. Wilson, advertising manager of Carter, Rice & Co., Corp., who has been absent since January on account of illness, expects to return Wednesday on part time.

Forthcoming Dard Hunter Book on Making Of Paper by Hand in India

A Preview

By Harrison Elliott

It is rather the exception when the review of a book precedes its publication and when the reviewer has had access to the author's manuscript before it has been delivered to the printer. For that reason this may be termed a preview rather than a review. It was my privilege during a recent visit at the home of Dard Hunter to read the manuscript of his forthcoming book on the handmade paper industry in India as it exists today in a somewhat passing phase. Not only was the text read, but photographs, specimens of the papers and papermaking implements were all viewed and afforded evidence of as comprehensive a bit of research as it was possible for the author of the book to make.

The visit was most opportune as it occurred at a time when Dard Hunter was engaged in inventorying and classifying his unique and interesting collection of paperiana prior to shipping it to the Massachusetts Institute of Technology where it will soon be installed as a museum and library of papermaking with its creator as curator. All this material has long been stored in a fireproof vault in his home where it was rather difficult of access, though carefully catalogued. To have it on view in the ample space which M.I.T. has set aside for it in a new building, will permit this rare educational exhibit to have the proper display facilities which it has long deserved.

A Long Cherished Ambition

It had long been Dard Hunter's ambition as part of a world-wide survey of hand papermaking to make a papermaking pilgrimage through India and visit those centers where the fast-vanishing craft still exists. For the purpose of rendering a first-hand and authentic account 7500 miles were covered by such modes of travel as train, auto, boat, oxcart and afoot. It was a carefully planned itinerary with guide and interpreter, and when the purpose of the quest was made known to them, the native papermakers would sense the sympathetic interest and would willingly show their skill. They would often carry their appliances from remote parts in order to complete a demonstration at some particular point. India has, of course, her machine mills with modern equipment making writing, printing, wrapping and other papers. The handmade industry is simply a small but interesting and romantic survival of an ancient craft of which this book is to be a lasting and authoritative record, not only as to text and illustrations, but also with actual specimens inserted of those rare and curious papers obtainable only by difficult travel to the scene of their making.

Little Demand in India

As the manuscript states, there is little demand for handmade paper in India today, and they have a mistaken notion that they must compete with machine-made instead of making the hand product of a finer quality and an art in itself, and making a superior sort of paper which would be most serviceable for documents, bank-notes, account books, etc. The opinion is also expressed that unless some sort of assistance comes from the outside, the handmade industry will disappear from the papermaking scene in another decade. India is rich in fibrous plants most suitable for papermaking and which would give distinction to the product, but these hand papermakers have not the appliances nor the ingenuity to permit them to make good use of the materials at hand. There is, however, a school of hand papermaking under the sponsorship of Gandhi which Dard Hunter visited when he had his interview with Gandhi, and was told that the school's method of papermaking was more nearly a handmade process in its entirety than existed elsewhere. Gandhi, it is told, regards the making of paper by hand almost as important as weaving.

There is never much in the way of discarded rags in the remote regions where the hand process is still pursued. Every available scrap is used for clothing until it is so worn that it is of little use for anything else. A commonly used raw stock is mixed unprinted waste paper cuttings from print shops, more in the nature of refuse than a wholesome raw material. This stuff is easily reduced to pulp by moistening and treading under foot in large earthen jars. However, textile waste, old rope, mats, gunny sacks, fish nets, flax and flax refuse are used, but owing to the poverty of the country such material is in pretty poor shape by the time the papermaker gets it. The general tendency is to accomplish the task with the least possible expenditure of effort, and that is why so much of their paper is made from waste paper which is easily pulped.

Principle Generally the Same

In principle the hand process in India is very much the same in different localities. A difference in the raw material used will naturally require different methods of treatment to reduce it to a fibrous state. The stamper, an adaptation of the mortar and pestle idea, and which is an ancient device for pounding rice and all kinds of grain, is commonly used where tougher raw material is employed than waste paper. The stamper consists of a long wooden hammer-like beam or tilt bar horizontally placed on a fulcrum. At one end is the head which is shod with iron and this part is raised and lowered by leverage in a vat or mortar of stone which contains the raw material to be pulped. The raw material is fed by hand by a man stationed at the mortar for that purpose. The other end of the beam is given its tilt either by a cam on the axle of a waterwheel or by man power produced by stepping on and off that end of the beam with some rapidity. Clinging to the end of a rope which

WEST COAST HEMLOCK PULP
PULP DIVISION WEYERHAEUSER TIMBER COMPANY

hangs overhead enables the tilter to steady himself while engaged in this treadmill operation.

The vat containing the pulp to be made in sheet form is partly sunken in the ground and the vatman who forms the sheet of paper on the mould sits or squats at his work. The moulds are made with a detached flexible screen of grass which corresponds with the laid wires in European hand moulds. These grass culms are laced across with horse hair at intervals about an inch apart to hold them together and leave their imprint as chain lines in the paper. This cover for the mould generally measures about 29½ x 33 inches.

The mould is dipped into the vat and raised with the water draining through. If a heavier sheet is desired than the consistency of the pulp and a single dipping will produce, a second dipping is made and another layer of pulp is superimposed over the first. One sheet is couched on another and a pile or post is subjected to a pressing to remove the moisture by protecting it with boards and placing on top stones of great weight—a simple and somewhat effective device. This does not express a sufficient amount of moisture, but permits handling and the laying of the sheets against a smooth wall where they remain until they dry out sufficiently and drop off of their own weight.

The Sizing

The sizing, rather generally, consists of rice or wheat paste applied to the surface of the sheet with a trowel-like tool covered with woven cloth. In other localities something resembling a mitten is used. A surface finish is imparted to the sheet by rubbing with a smooth stone, usually agate, im bedded in a clump of clay or pulp made to fit the hand. The stone is often slightly oiled to prevent scratching, a rubbing on the hair of the head suffices as lubrication. The sheet to be glazed is backed with three or four sheets and laid on a smooth board and the polishing stone applied by hand. This procedure gives a wax-like polish and a somewhat streaky glaze to the sheet. It has a tendency to toughen the sheet and to make the paper rather leathery in texture. Each sheet is subjected to this treatment anywhere from five to fifteen minutes. Native paper made of cotton fiber lends itself well to the smoothing stone and takes a better finish than other materials.

When color is resorted to, the most popular seems to be yellow. Blue is also used but to a more limited extent. While handmade paper in India, is made in sheets usually measuring about 28 x 32 inches, the sheets are rolled rather than kept flat, a practice which would not appeal to the Occidental printer. Deckle edges are not regarded as an ornament and are trimmed off. The method of trimming is to clamp a number of sheets in a vice-like contrivance and cut off the rough edges with a long blade resembling a sword.

This preview is merely a sketchy résumé which only outlines the Indian method of making paper by hand. The book is to be divided into chapters with a detailed description and illustrations of the technique and the raw material used in each locality. It will be a work which might be read as a book of travel or an exposition of the economic conditions in India today. Primarily it is a highly informative record and a most comprehensive treatment of the subject of an interesting phase of papermaking. It is a chronicle of a technique which was found to have disappeared in some parts of the country and must eventually cease entirely before long.

The Photographic Illustrations

In the photographic illustrations which are to be reproduced in photogravure and number eighty-eight, one is struck by the serious mien of the papermakers. The craft with them has all the appearance of being a religious rite. But there was nothing mysterious about it in the demonstrations which they gave. They were willing performers and displayed a pride in their work even if it is doomed to die out in time.

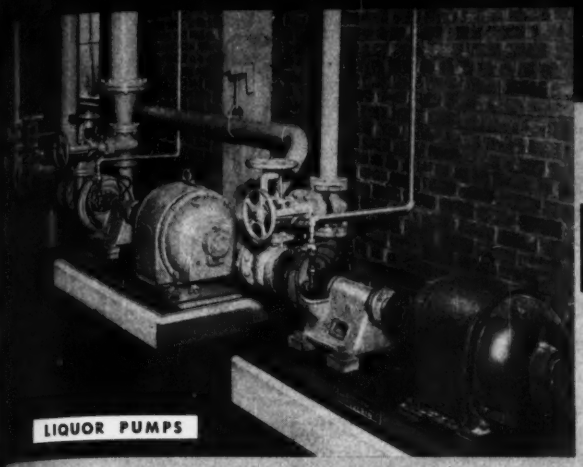
The matter of collecting sufficient paper specimens for the book has imposed a certain limitation on the size of the edition. In all probability there will not be more than 370 copies printed, and these will all be on handmade paper. The book will be designed by Elmer Adler of the Pynson Printers, and printed by that press, which will insure a beautiful bit of book production and a dress significant and worthy of the subject matter.

Sewage Pumps

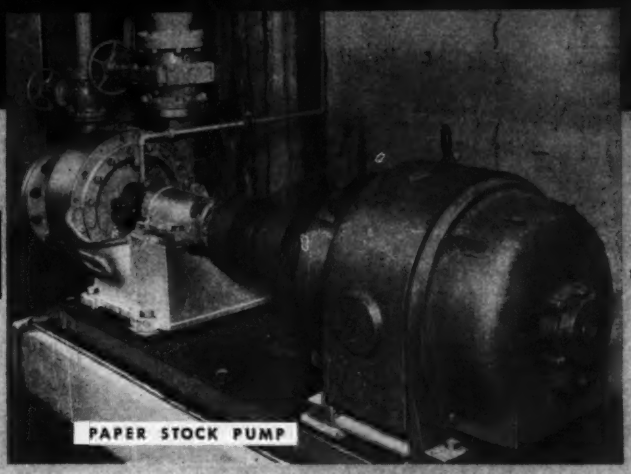
The designing of centrifugal pumps to handle liquids carrying solids in suspension, such as unscreened sewage and wood pulp in paper mills, was discussed by A. Peterson, chief engineer of the pump department of the De Laval Steam Turbine Company, Trenton, N. J., in a paper presented last fall before a section of the American Society of Mechanical Engineers and now made available for general distribution. So-called non-clogging, or clogless, pumps are characterized by single suction impellers having large open passages without corners or surfaces upon which stringy materials or rags may hang up and accumulate. Ordinarily such impellers are of the enclosed type, as where the liquid carries grit, shrouded impellers retain their initial efficiency longer than do open impellers. The size of spheres that the impeller should be able to pass has been the subject of controversy, but ordinarily the ability to pass spheres up to within one or two inches of the diameter of the pump discharge nozzle is satisfactory, and in larger pumps three impeller vanes are preferable to two, as they guide the water better, resulting in higher efficiency. At low heads, even fairly small pumps should be run at slow speeds and the use of a speed reducing gear results in a cheaper and more efficient motor. A pump casing split at the plane of the shaft is recommended in the interest of accessibility. The use of mixed flow pumps, which permit of higher specific speeds, is also discussed.

A. C. Gilbert Receives Snell Estate

APPLETON, Wis., September 12, 1938—Title to stock held in the estate of Mrs. Mary Felker Snell of Neenah, Wis., passes to A. C. Gilbert, president of the Gilbert Paper Company, Menasha, Wis., according to a final determination of the probate court at Oshkosh, Wis. The stock consists of shares in the Gilbert company and the National Manufacturers Bank of Neenah, and its value is placed at $254,575.96. Mr. Gilbert was Mrs. Snell's stepson, and he was one of the administrators of the estate, which had a net value of $321,495.21.



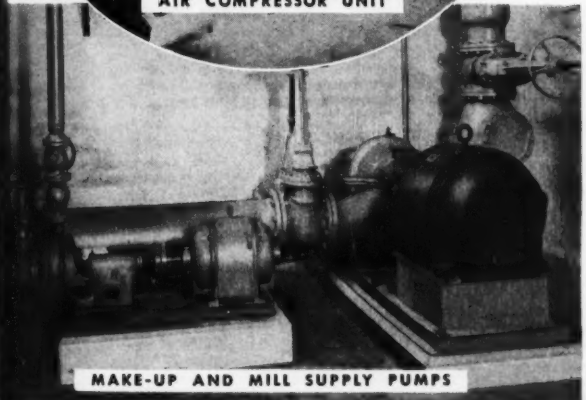
LIQUOR PUMPS



PAPER STOCK PUMP

NGERSOLL-RAND *Equipment in* FERNANDINA MILL *of* CONTAINER CORP. *of* AMERICA

AIR COMPRESSOR UNIT



MAKE-UP AND MILL SUPPLY PUMPS

This new sulphate pulp mill at Fernandina, Florida, has recently been added to the large and growing list of satisfied users of I-R paper mill equipment. One of the most modern plants in the country, this mill turns out 150 tons of sulphate pulp daily.

Ingersoll-Rand stock pumps, liquor pumps, mill and knotter supply pumps, boiler-feed pumps and air compressors all play an important part in the production of pulp.

The complete line of I-R pumps, compressors, vacuum pumps, condensers, water-vapor refrigeration, Diesels, pneumatic tools and blowers is widely used in both large and small paper mills the world over.

Let one of our engineers help you with your problems. Their experience combined with yours may help you to reduce operating costs.

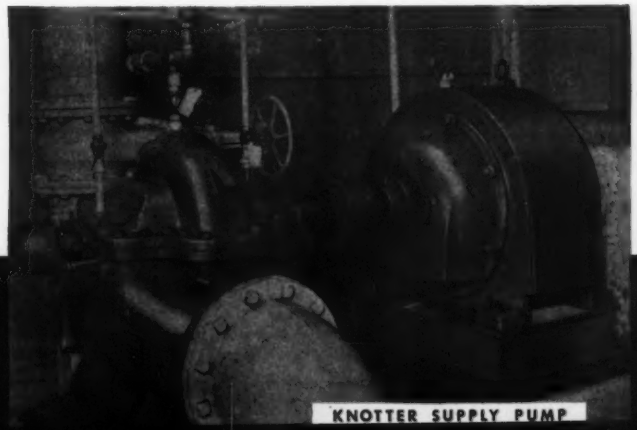
R PRODUCTS INCLUDE: CAMERON PUMPS, COMPRESSORS, EJEC-ORS, CONDENSERS, DIESELS, PNEUMATIC TOOLS and BLOWERS.

Ingersoll-Rand

Branches or Distributors in Principal cities the world over.

11 BROADWAY, NEW YORK, N. Y.

Cleveland	Hartford	New York	San Francisco
Dallas	Houston	Philadelphia	Scranton
Denver	Kansas City	Picher	Seattle
Detroit	Knoxville	Pittsburgh	St. Louis
Duluth	Los Angeles	Pottsville	Tulsa
El Paso	Newark	Salt Lake City	Washington



KNOTTER SUPPLY PUMP

W. R. Barber Made Technical Director

The Crown Zellerbach Corporation announces, through Albert Bankus, vice president, the appointment of W. R. Barber as technical director of the corporation, succeeding Dr. E. C. Lathrop, who resigned recently to return to the Celotex Corporation.

Mr. Barber has been associated with the Crown Zellerbach Corporation for the past eight years, in the technology of pulp and paper operations, development and research. For the past three years he has acted in the capacity of technical supervisor of the Camas, Wash. mill.

In his new position, Mr. Barber will be director of the technical work for all the Crown Zellerbach properties, including seven pulp and paper mills. These include the Crown Willamette Paper Company Division mills at Camas, Wash., Lebanon and West Linn, Ore.; the Washington Pulp and Paper Corporation Division at Port Angeles; the National Paper Products Company Division at Port Townsend, Wash. and Carthage, N. Y., and Pacific Mills, Ltd., at Ocean Falls, B. C. Also under his supervision will be the technical activities of the Western Waxed Paper Company Division, with plants at Los Angeles and Oakland, Cal., and at North Portland, Ore., as well as the Crown Willamette Converting plants at Los Angeles, Cal. and Harlingen, Tex., and that of Pacific Mills, Ltd., at Vancouver, B. C.

W. R. Barber

A native of New York State, Mr. Barber received his high school education there, before moving to the West. Subsequently he attended Leland Stanford Junior University at Palo Alto, Cal., from which he received his degree of A.B. in Chemistry in 1919, and the advanced degree of Chemical Engineer in 1921. This was followed by another year of graduate work in chemical engineering.

He became Assistant to the Commissioner of the United States District Court of Utah, specializing in the technical aspects of smelter smoke litigation in the Salt Lake Valley, some time before becoming connected with the Crown Zellerbach organization.

Mr. Barber is a member of Phi Beta Kappa; Sigma Xi, honorary scientific society; Phi Lambda Upsilon, honorary chemical society, and TAPPI for which he served as Vice-Chairman of the Pacific Coast Section in 1934-1935 and Chairman in 1935-1936; followed by two years as a member of the Executive Committee.

Central Technical Headquarters of the corporation will remain at the Camas mill.

F. A. Olmsted succeeds Mr. Barber as Camas mill technical supervisor, advancing from the post of assistant.

National Sales Crusade in Boston

BOSTON, Mass., September 12, 1938—Approximately 200 executives, sales managers and salesmen of the paper trade in Metropolitan Boston listened to an inspiring address on salesmanship by E. M. Johnston at a meeting at the Hotel Kenmore Wednesday evening, held under the auspices of the New England Paper Merchants Association in connection with the National Sales Crusade and "Sales Mean Jobs" campaign. Vice-President John F. Blackman presided in the absence of President John R. Halkyard and Vice-President John H. Brewer on account of illness. Prior to the meeting a buffet supper was served.

Mr. Johnston, who is prominent in training salesman and who has had experience in the paper business, having worked with the Chicago Paper Company and the Cleveland Paper Company, called attention to the fact that sales make jobs and jobs make sales, urging the adoption of the Liberty Bond slogan, "Buy Until It Hurts." The speaker briefly outlined the history of the National Sales Crusade, noting the first meeting in Lincoln, Nebraska, May 16, 1938, describing methods by which the meeting was made a success. This campaign is of a constructive nature to help people live rather than die, he said.

Referring to the old philosophy of thrift of Benjamin Franklin, the speaker emphasized as more important the turnover of dollars. He intimated that we must cease taking our troubles to Washington for there are not enough practical men there to solve anything. This is a community movement, a cooperative movement, which all should get behind. It is a spontaneous campaign in which we are hopeful for the moment, but we must work for the end of the year.

The buying public is judging by first, how you look; second, what you do; third, what you say, and fourth, how you say it.

To become a better salesman, one should become more specific. There is one-quarter in what we say and three-quarters in the way we say it. I should insist on every salesman's taking a course in public speaking. Your voice is your capital. Cause people to remember what you say.

Lawrence Pump Issues Bulletin

The Lawrence Machine and Pump Corporation, 371 Market street, Lawrence, Mass., announces the issue of its Bulletin 203-2 describing its acid and chemical pumps.

The bulletin covers fully the construction of this type of pulp, and contains many interesting diagrams and illustrations.

This bulletin should prove especially interesting to engineers and superintendents who are concerned with the problem of pumping acids and other corrosive liquids.

THE Soundview Pulp Company is known for the fine qualities of its sulphite pulp by paper mills throughout the United States and in many foreign countries. This mill is considered one of the most modern—in design, construction, equipment, and methods. Operating the largest mill in the world, this company reached a production in excess of 500 tons per day shortly after the completion of a recent expansion program.

Soundview uses Pennsylvania Salt's Liquid Chlorine and Caustic Soda, and since 1935 has used the Pennsylvania Salt Chlorine Dispersion Method* in one of its units.

* U. S. Patent 1,971,241, dated August 21, 1934. Also fully protected in twelve foreign countries.

PENNSYLVANIA SALT MANUFACTURING COMPANY • Est. 1850
Widener Bldg., Philadelphia, Pa.
New York • Chicago • St. Louis • Pittsburgh • Tacoma • Wyandotte

WORLD'S LARGEST BLEACHED SULPHITE PULP MILL USES

CHLORINE DISPERSION METHOD

DEVELOPED BY PENNSYLVANIA SALT MANUFACTURING CO.

Soundview Pulp Company's mill at Everett, Washington

PENNSYLVANIA SALT *Chemicals*

CONSTRUCTION NEWS

A Summary of Vital Facts Regarding Construction, Financing and Operation of Pulp and Paper Mills

General Construction News

Neenah, Wis.—The Kimberly-Clark Corporation, manufacturer of cover papers, wall papers and allied paper stocks, has approved plans for new addition to mill, to be one-story, 70 x 160 feet, designed for storage and distributing service. It is reported to cost over $35,000, with equipment. General erection contract has been let to the C. R. Meyers & Sons Company, 50 State street, Oshkosk, Wis., and work is scheduled to be placed under way at once. An award for structural steel has been made to the Vulcan Manufacturing Company, Fond du Lac, Wis.

Jacksonville, Fla.—The United States Gypsum Company, 300 West Adams street, Chicago, Ill., manufacturer of wall board, plaster board and kindred products, has purchased a site on the Trout River, Jacksonville, for a new mill, recently reported in these columns, and will proceed with plans for buildings at once. Company has secured an extensive tract of land at location noted, with waterfront facilities to provide for handling of raw materials by water shipments from deposits in Nova Scotia. New mill consists of several one and multi-story units, with power house, machine shop, pumping station and other auxiliary structures, estimated to cost close to $1,000,000 with machinery. Large capacity will be carried out. It is proposed to begin work on project in near future.

Chicago, Ill.—The Cleveland Container Corporation, South Hermitage street and West Pershing road, manufacturer of paper cans, paper tubing, fiber drums and allied products, has arranged for lease of the three-story and basement industrial building on local site at 1328 West Thirty-seventh street, totaling about 50,650 square feet of floor space, and will occupy for plant. Structure will be improved and equipment installed at early date. It is understood that present plant will be removed to new location and increased capacity carried out. Main offices of company are at 10630 Berea road, Cleveland, Ohio.

Franklin, Ohio—The Logan-Long Company, manufacturer of roll roofing products, shingles, etc., is planning for immediate rebuilding of portion mill recently damaged by fire, confined largely to the processing department at mill, including processing oven and equipment. An official estimate of loss has not been announced.

New York, N. Y.—The Celanese Corporation of America, Inc., 180 Madison avenue, New York, N. Y., manufacturer of cellulose rayon products, has arranged for sale of a bond issue of $10,000,000, and will use a portion of fund for improvements and developments in mill at Amcelle, near Cumberland, Md., including installation of additional equipment for increased operating efficiency. Also company is said to be planning to use part of appropriation to begin work on proposed new mill in vicinity of Narrows, Va., where tract of about 1200 acres of land is being held, as previously noted in these columns. Proposed plant will comprise several large production units, power house, pumping station and accessory structures, and will represent an investment of about $5,000,000.

Los Angeles, Cal.—The National Automotive Fibres, Inc., 6000 Randolph street, manufacturer of fiber specialties for automotive service, has approved plans for new addition to local mill, to be 140 x 200 feet. It will be used primarily for storage and distributing service. Cost estimated over $50,000, with equipment. General erection contract has been awarded to the William P. Neil Company, 4814 Loma Vista avenue, Los Angeles, and work will be placed under way at early date. Harry T. Miller, last noted address, is architect. Main offices of company are at Railroad avenue and Kennedy street, Oakland, Cal.

Chicago, Ill.—Fire recently damaged a portion of plant of the General Paper Stock Company, 2455 North Elston avenue, paper products, with loss reported close to $15,000, with equipment. It is proposed to rebuild at early date.

Chester, Pa.—The Scott Paper Company, manufacturer of tissue paper stocks, has awarded a general contract to Wark & Co., Inc., 1608 Walnut street, Philadelphia, Pa., for new addition to mill, to be equipped for expansion in paper-making division, as previously noted in these columns. Work on superstructure will be placed in progress at once. New building is to be equipped with a paper-making machine and accessory equipment to increase capacity about 16 per cent, and will be located on a site formerly occupied by the Alpha Boat Club, a tract of land acquired by company for the expansion program. New unit will form part of the $3,000,000 development to be carried out at the mill. The Stone & Webster Engineering Corporation, is engineer and contractor for the work.

Savannah, Ga.—The Dixie Asphalt Products Company, Savannah, recently organized, has begun erection of new local mill for the manufacture of prepared roofing specialties, shingles, etc., and proposes to have the plant ready for occupancy by the close of the year. As previously announced in these columns, it will consist of several one-story units

JORDANS WON'T ANSWER QUESTIONS!

If you were to ask one of your jordans (or hydrators or beaters) a question like "how much strength increase are you giving my pulp for all the power I'm feeding you?" about the only answer you would get would be a continued drone of silence. A jordan won't talk!

And neither will the papermachine. Even if it could, it would talk about itself—because it has its own problems.

But if you really want to know, take the problem to the laboratory. There you can isolate it and get the answer—free from confusing and deluding contradictions. There you can tell the difference between "slowness" and "shortness"—between "wet-beating" and "cutting"—between good pulp and poor pulp—for stock preparation standards —for pulp evaluation—for quick consistencies —for color matching.

Use the Valley Laboratory Beater and Sheet-Making Equipment. For positive, conclusive answers to *all* vital production questions convert your laboratory into a *miniature mill* with Valley's complete line of Laboratory Equipment.

VALLEY

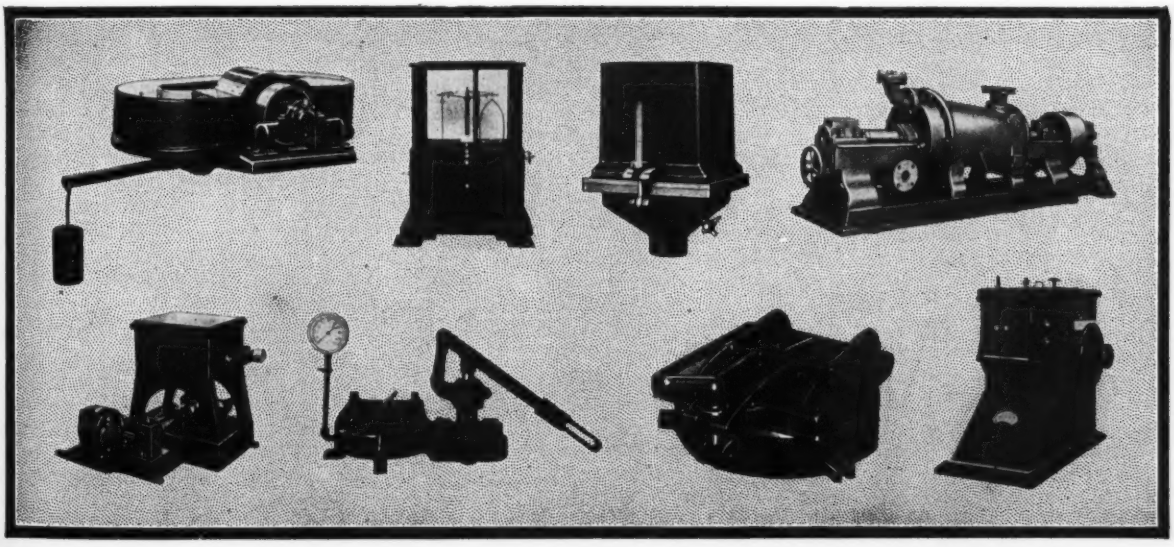
Iron Works Company

Plant: Appleton, Wisconsin

Harry Bennett, Eastern Representative 12 McKinley St., Bronxville, Westchester Co., New York.

Canadian Agents: Pulp & Paper Mill Acc. Ltd., Dominion Square Building, Montreal, Quebec, Canada.

This illustration shows pictures of the Beater, Drying Oven, Sheet Mould, Jordan, Flat Screen, Hydraulic Press, Hot Plate and Size Tester. Other items include Washer Cylinders, Couch Rolls, Fractionating Screens, Clay Erosion Tester and Bleachability Tester.



REPRESENTATIVES IN U. S. A. AND MEXICO

OF THE

FINNISH CELLULOSE ASSOCIATION

HELSINGFORS, FINLAND

FINNISH WOOD PULP UNION

HELSINGFORS, FINLAND

PULP SALES CORPORATION

230 PARK AVENUE

NEW YORK, N. Y.

equipped for large capacity, with storage and distributing structures, boiler plant and miscellaneous buildings. It is estimated to cost in excess of $200,000 with equipment. The Artley Company, 504 East Bay street, Savannah, is general contractor for construction.

New York, N. Y.—The Commercial Box and Supply Company, 130 Bleecker street, manufacturer of corrugated paper boxes and containers, has leased the building at 126 Bleecker street, and will improve and occupy for expansion in operations.

Chicago, Ill.—The National Paper Company, Hubbard avenue and Green street, manufacturer of paper specialties, has had plans prepared by W. T. Braum, 228 North La Salle street, Chicago, architect, for proposed new addition to plant, lately referred to in these columns. New unit will be three-story and basement, instead of one-story, as previously announced, and will be used primarily for expansion in storage and distributing division. It is estimated to cost over $30,000, with equipment. Bids have been asked on contract for general erection and award is scheduled to be made soon.

New Companies

New York, N. Y.—The Mills Paper Company, Inc., has been chartered with capital of $10,000, to deal in paper products of various kinds. New company is represented by B. Robbins, 25 Warren street, New York, attorney.

Vineland, N. J.—Foss & Co., Inc., has been incorporated with a capital of 2500 shares of stock, no par value, to manufacture and deal in wall paper products. Louis Foss is one of the heads of company, and representative.

New York, N. Y.—The International Fibre Corporation has been formed with capital of $10,000, to deal in fiber products of various kinds. New company is represented by Maurice Lefkort, 570 Seventh avenue, New York, attorney.

Reserve Cars on the "Forty-Niner"

The National Association of Waste Material Dealers, Inc., through its executive offices in New York, announces that it has reserved additional space on the crack streamline train known as the "Forty-niner" leaving Chicago for San Francisco on Friday morning, October 14 and arriving in the Convention City on Sunday forenoon. Considerable additional space has been necessary to accommodate members who have, within the last ten days, decided to make the trip. Already Chicago has shown a lot of enthusiasm and additional reservations for train space are coming in from that city daily. New York, Philadelphia, St. Louis, Detroit and other large cities will also be represented.

Reports received from the Convention Committee in San Francisco are to the effect that plans for the entertainment of delegates and their ladies are progressing rapidly with the Association's Pacific Coast membership and many outside its membership showing a keen interest and a desire to cooperate in making the association's first convention on the Pacific Coast a real success.

The convention committee urges all Eastern, Mid-Western and Southern delegates who are planning to attend the convention and who have not already notified the Committee's Eastern Headquarters, 1109 Times building, New York, to do so at once.

Monel Metal in Paper Mills

In a new 40-page Bulletin C-3, to be issued October 15, The International Nickel Company, Inc., 67 Wall street, New York, gives an interesting and informative outline of the merits, advantages and many practical uses of Monel, Nickel and Inconel in pulp and paper mills.

Monel is a 67 per cent nickel, 30 per cent copper alloy, stronger and more wear resisting than common non-ferrous metals and alloys, and stronger than structural steel. It is highly resistant to alkaline solutions and is used in pulp mills to handle soda and sulphate process cooking liquors, black liquors, and strong caustic liquors. It is also very suitable for use in contact with alum solutions, starch, casein, color solutions and salt water. The most general use of Monel is for vale trim-stems, seats and discas of digester blow-off valves in both sulphate and soda mills. A report from a sulphate mill states, "Monel trim on digester blow-off valves of circulating system, has been in service for eight years and is still in good condition." Soda pulp mills are also using Monel pipe lines and Monel sectional linings for rotary steel digesters are employed to protect welded joints from corrosion.

Monel has good corrosion resistance when used in equipment such as rotary pulp screens, thickeners and washers. Monel has also many uses in Fourdrinier and cylinder machines. Some of the many uses are linings for screen vats and flow boxes, save-all pans and trays, suction boxes and tops, machine screws and bolts, doctor blades, paper machine rolls, and table rolls.

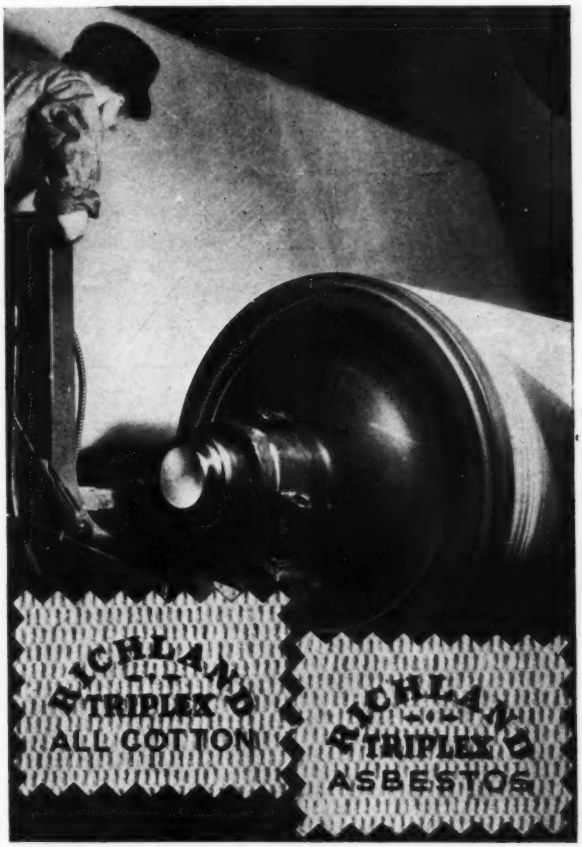
Monel is an excellent material for use in caustic recovery systems in sulphate and soda mills. The *Bulletin* states the oldest installation of welded Monel tubing in a soda process black liquor evaporator, dates back to 1922. After the tubes had been in service 101 months, samples of the 0.049 inch tubing showed a wall thickness of 0.048, a loss of about only .001 inch after more than eight years service.

The special alloys manufactured by the company known as "K" Monel, "H" Monel and "S" Monel, were developed for requirements demanding the corrosion resisting qualities of Monel, plus higher strength and hardness than formerly obtainable in non-ferrous alloys. "K" Monel is employed in severe pump services and for doctor blades against cast iron dryers. The alloys "H" Monel and "S" Monel are cast products, ranging from 175 to 350 Brinell (3000 kg). They are useful in equipment where abrasion and corrosion difficulties must be met, such as casings for pumping such abrasive and corrosive materials as black liquor and salt cake.

Cast "S" Monel has valuable non-galling characteristics which is utilized in Vulcan soot blowers having steam valve heads with "S" Monel piston-type discs operating without galling in cylinder lines of seamless Monel tubing.

The use of nickel is not limited to caustic soda service. It has good resistance to many corrosive conditions in pulp and paper mills. For example, the *Bulletin* states that corrosion and pitting at the bottom of sulphate pulp diffusers, and like action in soda process wash pans, can be overcome by a layer of nickel bonded by heat rolling to the vulnerable sections.

Fast and Uniform Drying WITH



Precision Dryer Felts

It is not only essential that dryer felts dry quickly, they must also dry uniformly if the finest quality of paper is to be expected . . . maximum speeds maintained . . . and steam consumption kept at a minimum.

RICHLAND TRIPLEX all cotton and asbestos felts are fast drying felts. They also dry with a high degree of uniformity because they are woven on the finest modern looms to rigid standards of tolerance. They are really precision fabrics. Specify RICHLAND TRIPLEX. Under comparable conditions of operation they will give you higher efficiency and longer wear.

MT. VERNON-WOODBERRY MILLS, INC.
TURNER HALSEY COMPANY
40 WORTH STREET *Selling Agents* NEW YORK CITY
Branch Offices: SAN FRANCISCO · NEW ORLEANS · CHICAGO · BOSTON · BALTIMORE

PAPER TRADE
ESTABLISHED 1872
JOURNAL

Reg. U. S. Pat. Off.

George S. Macdonald, Pres. *Joseph P. Horgan, Secy.*
Executive and Editorial Offices, 15 West 47th St., New York, N. Y.

Henry J. Berger
EDITOR

Ronald G. Macdonald
Editor Technical Section

Lynne M. Lamm
Washington Correspondent

Per Copy, 10 cents United States, Per Annum, $4.00
Canada and Foreign Countries in Postal Union, $6.00

Member Audit Bureau of Circulations

Vol. CVII New York, September 15, 1938 No. 11

CAPITAL STOCK TAX

The Capital Stock Tax and the Excess Profits Tax as enacted in the Revenue Act of 1936 imposed so heavy a burden upon industry that the most severe measures in these levies had to be amended. To comply with the requirements of the old capital stock tax, corporations were obliged to estimate an indefinite period in the future in an attempt to arrive at the declared value of its capital stock. In complying with the excess profits tax, a corporation was heavily penalized for reinvesting its funds or "plowing back" earnings into its business.

The Revenue Act of 1938 has modified some of the bad measures in these two taxes. The rate of capital stock tax under the 1938 law is the same as under the old law, being $1 for each $1000 of adjusted declared value of the capital stock. A new declaration of value was permitted in the return for the current year, ended June 30, 1938, the tax being based on the value declared by the corporate return. The tax was due within one month or in July, 1938, and is due each third year thereafter. Taxes for the years ending June 30, 1939 and June 30, 1940, will be based upon the value declared in the return for the current year, adjusted as provided by the law. For the year ending June 30, 1941, a new declaration of value will be permitted.

The Revenue Act of 1938 in amending the too severe law in the prior act, provides a tax in addition to the corporation income tax, and applies to the net income in excess of 10 per cent of the adjusted declared value of the capital stock of corporations subject to the capital stock tax. If the net income is less than 10 per cent of the adjusted value, no excess profits tax need be paid. On returns for the current calendar year, the adjusted declared value to be used is the value shown in the capital tax return filed in July 1938, and the rates are 6 per cent of such portions of the net income in excess of 10 per cent and not in excess of 15 per cent of the adjusted declared values; and 12 per cent in excess of 15 per cent of the adjusted declared value. Corporations with net income subject to the excess profits tax must compute the tax before computing the income tax, as the excess profits is an allowable deduction in arriving at the net income subject to income tax. A credit of 85 per cent of the dividends received is allowed, but not in excess of 85 per cent of the adjusted net income.

This brief outline covers the basic requirements of these two taxes, the constitutionality of which has been questioned in two proceedings now on file in the appellate division of the United States Supreme Court. In commenting on that fact, Godfrey N. Nelson, lawyer and tax expert of the New York Times Company, said in part: "The petition in Chicago Telephone Supply Company vs. United States (23F. Supp. 471) was filed August 17, and that in William B. Scaife & Sons Company vs. William Driscoll, Collector of Internal Revenue, (94 Fed. (2d) 664) was previously filed. Although petitions for certiorari have not yet been granted, either case will no doubt be heard.

"The Chicago Telephone Supply Company proceeding arises under the Revenue Act of 1934, and the matter of William B. Scaife & Sons Company, under the act of 1935. Common to both of the statutes are the conditions that for the first year ending June 30 in respect of which the capital stock tax is imposed, 'the adjusted declared value shall be the value, as declared by the corporation in its first return . . . (which declaration of value cannot be amended.)' In each instance the return in question was the 'first return.' The Chicago Telephone Supply Company declared a value of its capital stock for the year ended June 30, 1934, of $444,847.99, which resulted in the assessment of an excess profit tax, duly paid in 1933. The actual value of plaintiff's (taxpayer's) capital stock for the year concerned was stated as in excess of $2,000,000. The taxpayer filed in due time a claim for refund of the excess profits tax paid, alleging that the statute under which the tax was collected was unconstitutional. The claim was rejected, whereupon the taxpayer instituted suit for recovery in the Court of Claims."

In commenting on the claims of the taxpayer in this case, Mr. Nelson said in part: "It was contended in behalf of the taxpayer that an excess profits tax based on the declared value rather than the actual value is arbitrary and void for uncertainty and in violation of the Fifth Amendment of the Constitution. It was argued that the statute raises a conclusive presumption that the declared

value is the actual value, in the alternative, 'that if it does not raise a conclusive presumption, the taxpayer is liable only for such excess profits tax as would be due based on the actual value and the imposition on any other basis is void for uncertainty.'

"The court observed that 'the form of the statute is novel and somewhat peculiar' . . . that in their opinion 'the statute is plain and definite in forbidding amendment of the declaration that to place any other construction upon it would not express the intention of Congress but merely engraft or create a new provision'. The court also observed that if the case before them had involved a declaration for a 'previous year', the situation would be different; that then it could be argued that the statute conclusively presumed that the value stated for another year should be taken as the basis of the taxable year and that this would be 'purely arbitrary' on the probability that the value determined more than a year in advance would not be correct. The court observed that 'the constitutional question arising in the case is not free from doubt.'

"As indicated in the opinion of the Circuit Court of Appeals, even if the statute is held constitutional under the conditions here dealt with, the question as to its validity when the declaration of value is applied to subsequent years will not have been settled."

Map of the Pulp and Paper Mills

J. H. H. Muirhead, civil engineer and publisher, 230 West 108 street, New York, has just brought out a map of the pulp and paper mills of the United States, Canada and Newfoundland. The locations of all the pulp and paper mills are indicated on this map.

So many plants are located in Maine, Vermont, New Hampshire, New York, Massachusetts, Rhode Island, Connecticut, Eastern Pennsylvania, New Jersey, Delaware and Maryland that a large scale map has been inserted on the map itself.

Below the map is a list of the firms operating mills in each place. The classification of the industry is indicated by letters in front of firm names as follows: —A—Ground Wood Pulp. B—Soda Pulp. C—Sulphate Pulp. D—Sulphite Pulp. E—Book Paper. F—Building Paper. G—Newsprint Paper. H—Paper Board. K—Tissue Paper. L—Wrapping Paper. M—Writing Paper.

States are not listed alphabetically but are grouped in geographical order as used by the U. S. Department of Commerce. Pacific states are on the left and New England states on the right. The blank center of the map emphasizes the absence of mills from the Mountain states. The map is produced in several sizes and styles the most popular of which are as follows:—Small map, 22 x 31 inches, $1.50. Wall map, 32 x 44 inches, $2.50. Large lithoprint, 60 x 84 inches, $18.75.

Coy, Hunt in New Offices

Coy, Hunt & Company, general paper merchants, have announced the removal of their offices on September 12, to 425 Fourth avenue, New York.

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association.

COMPARATIVE MONTHLY SUMMARIES

Months	1938(c)	1937(c)	1936	1935	1934
January	63.9%	90.3%	76.1%	65.8%	.....
February	68.7%	90.1%	77.9%	70.0%	.....
March	69.6%	90.3%	76.0%	70.5%	.....
April	68.3%	92.1%	82.3%	70.0%	.....
May	69.0%	90.6%	81.6%	69.4%	.....
June	65.8%	87.3%	80.7%	72.3%	.....
July	71.9%	81.8%	77.3%	64.9%	.....
August	77.2%	82.9%	81.5%	70.9%	.....
September	.....	78.6%	80.5%	71.9%	58.2%
October	.....	73.5%	87.6%	75.6%	64.7%
November	.....	61.9%	88.0%	75.3%	61.7%
December	.....	54.5%	85.9%	71.2%	59.6%
Year Average	.....	80.6%	81.3%	70.5%	.....
First 35 weeks	69.3%	87.9%	79.2%	69.2%	.....

COMPARATIVE WEEKLY SUMMARIES

CURRENT WEEKS, 1938		CORRESPONDING WEEKS, 1937	
*July 30	77.3%	July 31	83.9%
*August 6	73.1%	August 7	82.6%
*August 13	77.1%	August 14	82.1%
*August 20	78.1%	August 21	83.7%
*August 27	80.1%	August 28	83.3%
*September 3	77.2%	September 4	80.7%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting, Current Weeks					
Ratio Limits	July 30, 1938	Aug. 6, 1938	Aug. 13, 1938	Aug. 20, 1938	Aug. 27, 1938	Sept. 3, 1938
0% to 50%	88	89	81	82	70	53
51% to 100%	220	217	225	214	208	111
Total Mills Reporting	308	306	306	296	278	164

* Subject to revision until all reports are received.
(c) Basic capacity data have been adjusted to correspond with ratings reported by individual companies.

PAPERBOARD OPERATING RATIOS

According to reports from the National Paperboard Association, per cents of operation, based on "Inch-Hours," were as follows:

Mos.	1938 (e)	1937 (e)	1936	1935	Mos.	1938 (e)	1937 (e)	1936	1935
Jan.	55%	80%	61%	61%	July	57%	67%	69%	59%
Feb.	61%	86%	67%	67%	Aug.	....	74%	75%	65%
Mar.	60%	87%	68%	67%	Sept.	....	70%	76%	69%
Apr.	57%	89%	70%	61%	Oct.	....	66%	82%	76%
May	58%	86%	68%	61%	Nov.	....	56%	79%	70%
June	56%	75%	68%	65%	Dec.	....	46%	74%	60%

Week end. July 30, 1938—64%
Week end. Aug. 6, 1938—64%
Week end. Aug. 13, 1938—65%
Week end. Aug. 20, 1938—67%
Week end. Aug. 27, 1938—69%
Week end. Sept. 3, 1938—67%

(e) Basic figures revised to include new members of the National Paperboard Assn.

To Cut More Pulpwood in Manchukuo

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., September 14, 1938—The Manchukuo government has extended permission to four Japanese wood pulp manufacturing companies to operate at full capacity, beginning next year, according to press reports from the office of the American Commercial Attache, Tokyo. It is expected that this action will increase the output of wood pulp in Manchukuo from 10,000 to 30,000 metric tons per year. This revision in the government's policy is due to the necessity of replenishing Japanese wood pulp stocks.

In the meantime, leading paper mills have been notified by the Ministry of Commerce to reduce their deliveries of paper to newspaper publishing companies using more than 1,000 reams monthly by 12 percent, beginning September 1. It is understood that a reduction of 20 percent is to be ordered shortly in the amount of paper consumed by magazines. These steps are reported to be necessary owing to the shortage of wood pulp.

Have you tested the new

New Jersey Zinc

ZINC SULFIDE

CRYPTONE ZS-30

FOR THE PAPER INDUSTRY

It's better in

- COLOR
- BRIGHTNESS
- OPACITY
- VALUE

THE NEW JERSEY ZINC COMPANY
160 Front Street New York, N. Y.

Please send a ____lb. sample of your new ZINC SULFIDE, Cryptone ZS-30 to:

Name_____

Address_____

Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Economics of High Pressure Steam for Paper Mill Power Plants*

Alf Kolflat[1]

Abstract

The subject of economics of high pressure steam for paper mill power plants is discussed in this paper in three sections: (1) Heat economy, or fuel saving which may be expected by increase in steam pressure; (2) First cost of steam equipment as affected by an increase in design pressure; and, (3) Comparison of combined annual fuel cost and fixed charges. The first cost and operating cost for different steam pressures is analyzed for three typical plant sizes.

Introduction

In recent years, the developments in the paper industry are intimately interrelated with the generation of mechanical and electrical power, and, as is the case in most other industries, the increased use of power has increased productivity and decreased production cost, which has created new applications and a wider market for the use of paper and related products.

The earlier paper mills were all located on rivers in order to obtain transportation for the wood, an adequate water supply, and, last but not least, water power. Even though steam power was available when paper making grew from a handicraft to an industry, there seemed to be a preference for water power. I do not know if this preference was entirely due to the economic situation prevailing during the period, but to-day paper mills are more and more being located without regard to water power and made entirely dependent on steam power.

Most of the older paper mill boiler rooms are operated with steam pressures between 100 and 150-pounds per square inch and without superheat, so that the steam temperature approximates 360 deg. F. In the last few years, a number of mills have installed power plants designed for higher steam pressures of 450 and 650 lb. per square inch and for total steam temperatures up to 725 deg. F.

There is no definite demarcation between so-called low and high pressure steam, as the term varies with different types of industry, and as far as boiler pressures are concerned, the term "high pressure" is used more to signify pressures beyond what has been previously established as usual for the industry or the particular plant.

In the central stations of the utility companies, where power is the only product, economy in power generation is naturally of more relative importance than for an industry where the cost of power is one of many cost items. The steam pressures used in the power industry have in the the last fifteen to twenty years increased steadily. Some years after the world war, 300-pound steam pressure and 650 deg. F steam temperature were considered high, while to-day 1200-pounds pressure and 925 degree temperature are becoming quite common for larger installations, and pressures up to 2500 or 3000 pounds per square inch are being considered for some plants.

When a new paper mill is to be built or an available power plant has outgrown its usefulness, either due to insufficient capacity or high operating cost, then the progressive managers and operating engineers naturally raise the question: "What steam pressure is most desirable for our contemplated installation when first cost as well as operating cost are considered, and reliability and ease of operation are not forgotten?" When the technical magazines feature pressures up to 2500 pounds with topping units and other new ideas, then anything short of the highest possible steam pressure may seem conservative. It may be well to emphasize right here that the use of these extremely high pressures, even for very large units, give only a slim margin of profit over that obtained with moderately high pressures, and in some cases are sponsored more with the idea of doing pioneering work than for the purpose of obtaining additional dollar economy.

Each installation is a problem by itself and can only be answered by a careful analysis of the specific case.

I believe that even with this reservation it is possible and quite interesting to make a general analysis of the problem.

The economics of high pressure steam will be discussed in three sections:

(1) Heat economy or fuel savings which may be expected.

(2) Increase in cost of equipment as affected by pressures.

(3) The combination of fuel cost and fixed charges to give annual combined cost.

* Presented at the Fall Meeting of the Technical Association of the Pulp and Paper Industry, Green Bay, Wis., Sept. 8-10, 1938.

[1] Mechanical Engineer, Sargent & Lundy, Chicago, Ill.

I. Heat Economy of High Pressure Steam

In regard to the steam requirements for the average paper mill, it may be said that most of the process steam is used for paper machine drying at a pressure which varies between 5 and 35 pounds gauge, depending on the paper grade, thickness, etc.

Another major proportion of the steam is used for cooking in digesters, where the steam pressure requirements vary between 70 and 120 pounds gauge. These pressures are mainly determined by technological requirements of the process. These figures indicate why the older plants were usually designed for steam pressures of 100 to 150 pounds, as this gave a comfortable margin between the boiler pressure and the highest process pressure used in the plant.

"Condensing Power and By-Product Power"

It may be in order to outline in a few words the difference between "condensing power" and "by-product power." When steam is used for generation of power alone and where there are no requirements for process steam, approximately one-third of the heat in the steam can be converted into power and the remaining two-thirds of the heat in the steam is lost to the circulating water in the condensers. When, on the other hand, steam is generated, not only for the purpose of making power, but also to supply process and heating steam, then most of the heat which otherwise would be discharged to the condenser can be used in the process, and the steam turbine or engine acts somewhat as a pressure reducing valve but also abstracts an amount of heat from the steam which is equivalent to the power produced, while the remainder of the heat in the steam is partly or entirely used in the process. If all of the steam from the engines or turbines is used in the process, then the fuel requirement for the generation of "by-product power" is roughly one-third of the fuel requirement for condensing power.

In very few cases are the ratios between power and process steam such that all of the power required can be made as "by-product" power. Part of it usually has to be made condensing.

Heat Rates Assuming Constant Turbine Efficiency

The full advantage of increase in steam pressure is not obtained unless the steam temperature is increased simultaneously with the pressure. Our calculations are based on a gradual increase in steam temperature arranged so that at 150 pounds steam pressure the steam temperature will be 450 degrees and at 650 pounds pressure the temperature will be 690 degrees, as shown in Fig. 1 in the curve marked "temperature."

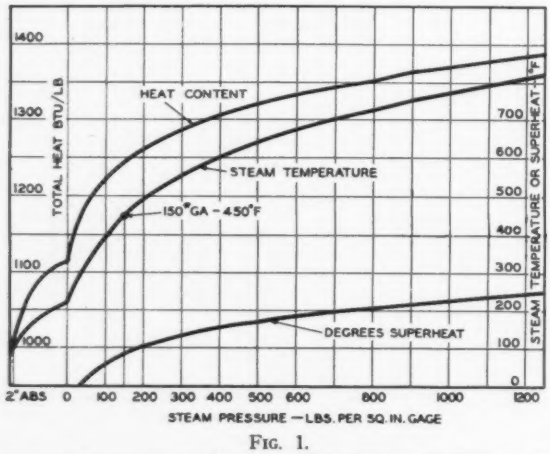


Fig. 1.

Steam Temperature, Superheat and Heat Content in Relation to Pressure. 70 per cent Cycle Efficiency.

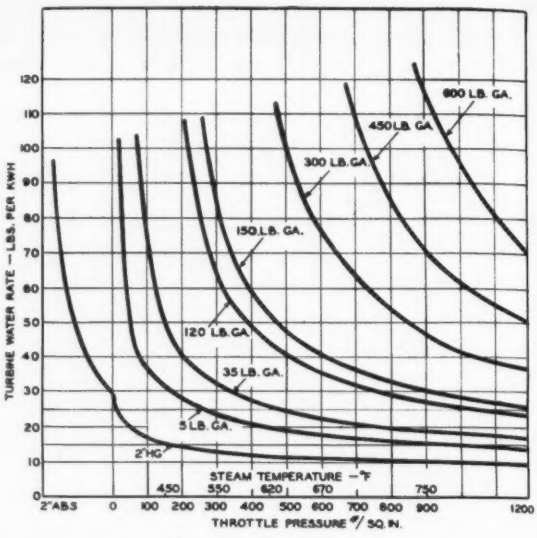


Fig. 2.

Turbine Water Rates for Various Throttle and Exhaust Pressures. Turbine Efficiency 70 per cent—Generator Efficiency 95 per cent. Exhaust Pressures Indicated on Curves.

Selections Well Suited to Different Processes Involved

There is a definite reason for the use of 150-pound pressure and 450 degree steam temperature as "anchor point." Most of the paper mills have a steam distribution piping system with cast iron fittings and valves, and this material should not continually be subjected to temperatures above this limit. The selection of this temperature-pressure relationship is also well suited to the different processes involved. I may add that a variation in temperature and pressure relationships from that assumed in this paper does not materially affect the results.

Direct Measure of Work Which Can Be Done Between These Pressure Ranges

The heat content of one pound of steam as it passes through the entire temperature and pressure range in a turbine with 70 per cent efficiency is also shown in Fig. 1. The difference in heat content of the steam between any two pressures on this curve is a direct measure of the work which can be done by steam working between these pressure ranges. For example, the curve indicates that one pound of steam working between 1200 pounds pressure at the throttle and 2 inches condenser pressure, can do twice as much work as one pound of steam working between 120 pound pressure and 2 inches condenser pressure.

The steam rates in pounds of steam per kw-hr of power generated for turbines operating at various pressure conditions are shown in Fig. 2 and are based on a constant turbine efficiency.

The steam rate curves do not quite accurately

picture the economy of the different steam pressures because the amount of fuel which is required to generate one pound of steam varies with the steam conditions.

Relative Water Rates and Heat Requirements of Different Cycles

The relative water rates and heat requirements of different cycles are shown in Fig. 3. The full drawn lines show the relative variation in water rate with variation in throttle pressure and back pressure. The dotted curve indicates the relative variation in heat rate, the water rate and heat rate at 150 pounds being taken as unity. It will be seen that if the heat rate at 150 pound pressure is taken as unity, the steam pressure will have to be increased to approximately 260 pounds in order to reduce the heat rate 10 per cent, and in order to get an additional 10 per cent improvement over the original figure, the pressure will have to be increased to 500 pounds; and only when the pressure has been increased to 1200 pounds has the heat requirement come down to 70 per cent of that required with 150 pounds pressure.

The above relationship in plant heat rates based on constant turbine efficiency is strictly true only for a condensing cycle, but calculations have been prepared for various percentages of extraction and they all show substantially the same relative ratio to the 150-pounds cycle.

Variation in Turbine Efficiency with Size and Steam Pressure

The efficiency of a steam turbine, or its ability to utilize the available heat head, decreases with decreasing turbine size because internal friction, blade leakage losses and other loss items, represent a larger and larger proportion. If the exhaust pressure is increased in ratio to the inlet pressure so that only a small heat head is available, then the losses in inlet valves, etc. become important, with consequent reduction in efficiency.

Figure 4 shows turbine efficiencies for three sizes

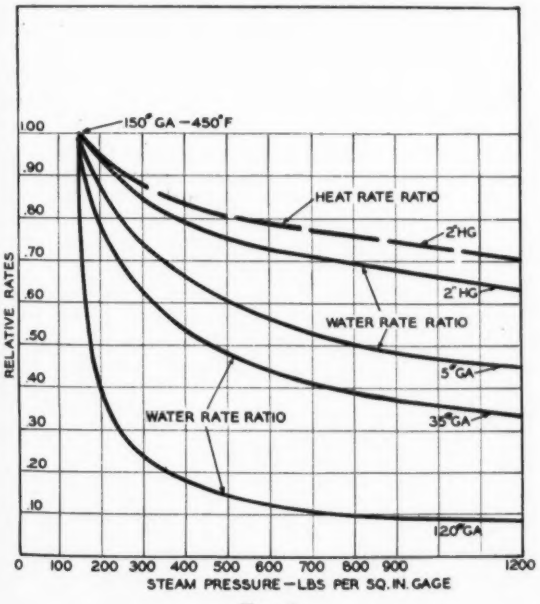


Fig. 3.

Relative Turbine Water Rates for Various Throttle Pressures and Exhaust Pressures. Relative Heat Rates for Condensing Cycle—2 In. HG. Turbine Efficiency 70 per cent—Generator Efficiency 95 per cent. 150 lbs. GA—450 degs. F. Taken as a Base.

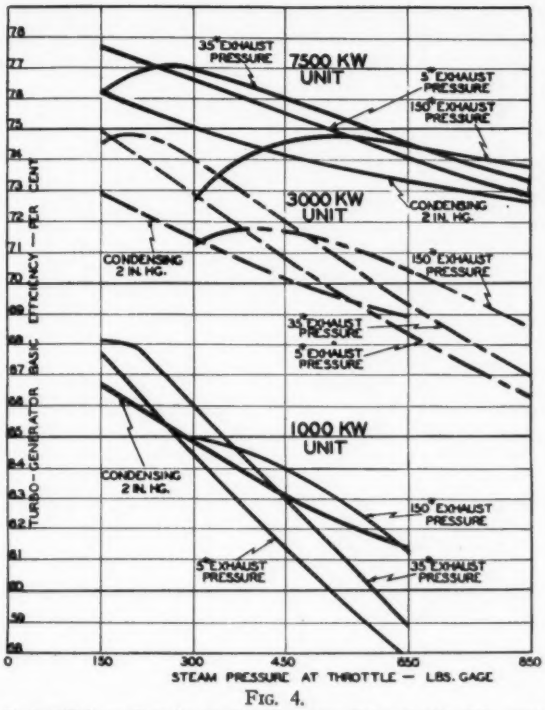


Fig. 4.

Basic Efficiency Data for Turbine-Generator Units of 1000 KW., 3000 KW. and 7500 KW. Capacity VS. Throttle Pressure. Non-Condensing Units—5 lbs., 35 lbs., and 150 lbs. Exhaust Pressures. Superheat—200 degs. F. Condensing Units 2 In. HG. No Allowance For Automatic Ex-Traction.

of units: namely, 1000 kw, 3000 kw, and 7500 kw, both for condensing and back pressure machines with variable back pressure. It will be seen from this curve that a straight condensing turbine with a capacity of 7500 kw and operated at 650-pounds steam pressure has a basic efficiency of 73.3 per cent, while for a 3000 kw unit and the same operating conditions, the efficiency has dropped to 69.0 per cent, and for a 1000 kw machine, the efficiency has dropped to 61.3 per cent.

The dropping off of turbine efficiency with increase in pressure for a 3000 kw machine with 5 pounds back pressure is illustrated by the fact that with 150 pounds initial pressure, the efficiency would be 75 per cent, while at 650 pounds pressure, the efficiency of the same turbine had decreased to 68.3 per cent. This dropping off in turbine efficiency with increase in steam pressure for a machine with a fixed rating is due to the fact that the steam volume decreases in the same proportion as the pressure increases, and the turbine blades become so small that leakage and other losses increase rapidly.

With increase in turbine size to 15,000 or 20,000 kw, the efficiency will, of course, remain more constant with increase in pressure, but turbines of this size are somewhat outside the scope of this paper.

Use of the "Automatic Extraction Pressure Machine"

The adoption of high steam pressure for industrial turbines usually leads to the use of the "automatic extraction pressure machine." This type of turbine is designed so that a variable amount of steam can be extracted for process uses at any desired intermediate pressure which can be maintained constant at all loads. Here, as in everything else, a benefit is not obtained without some sacrifice, and

the full load turbine efficiencies shown in Figure 4 will be reduced approximately 3 per cent for each extraction opening, and the half load efficiency will be reduced by 6 per cent.

Caution should therefore be used in specifying operating conditions for turbines with automatic extraction openings, so that the turbine designer can adapt the machine as much as possible to the most prevailing steam flow conditions of the particular plant. This characteristic of the automatic extraction turbine is often lost sight of. When a number of extraction pressures are desired, a better overall turbine room efficiency will usually be obtained if these openings are divided between different machines instead of designing each machine for more than one automatic extraction opening.

There is one more factor which should be specifically mentioned and that is the effect of boiler feed pump power. As the steam pressure increases, the power requirement of the boiler feed pump increases in direct proportion; and for 600 pound and higher steam pressures, this is quite an important factor.

It has been shown that the heat ratio curves in Fig. 3, which were based on constant turbine efficiency and 200 degrees superheat, require adjustments for boiler feed power, steam temperature and variations in turbine efficiency. All of these corrections have been incorporated in Fig. 5, which shows the actual final fuel ratios for various pressures expressed in relation to that which would be obtained with a steam pressure of 150 pounds gauge and a steam temperature of 450 deg. F. Fig. 5 gives a direct picture of the improvement in heat economy which will be effected when the pressure and temperature are increased, and represents the credit side of the problem.

II. Cost of Equipment

The preceding discussion has only dealt with the credit side of increasing the steam pressure and the effect on heat and fuel economy. On the debit side, the cost of equipment is increased with increase in pressure, and it naturally comes to a point where the fixed charges and interest on the increased cost of equipment offset the gain in heat economy for the particular installation.

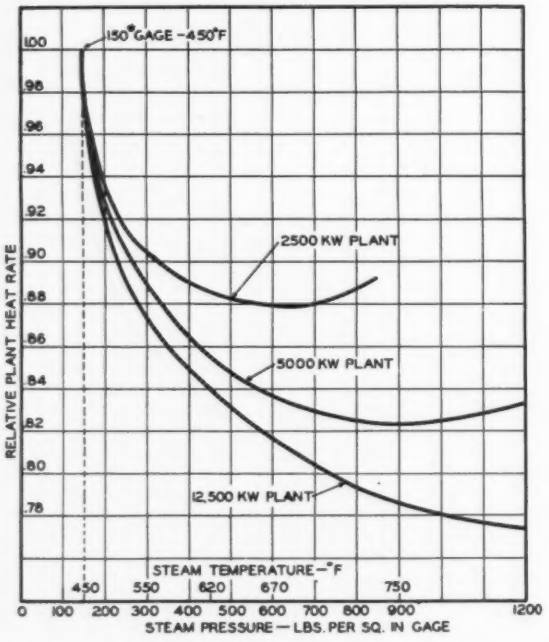


FIG. 5.
Relative Overall Plant Heat Rate for Various Steam Pressures in a Two Unit Plant. Corrected for Variations in Turbine Efficiency and Boiler Feed Pump Power.

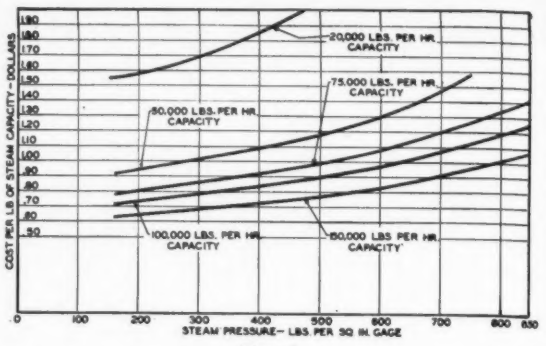

20,000 LBS. PER HR. CAPACITY
75,000 LBS. PER HR. CAPACITY
50,000 LBS. PER HR. CAPACITY
100,000 LBS. PER HR. CAPACITY
150,000 LBS. PER HR. CAPACITY
COST PER LB. OF STEAM CAPACITY - DOLLARS
STEAM PRESSURE - LBS. PER SQ. IN. GAGE

FIG. 6.
Cost of Different Size Steam Generating Units for the Pressure Range 160 lbs. to 850 lbs. and 750 degs. F. Temp. Costs are Given in Dollars Per Lb. of Steaming Capacity and Include Fuel Burning Equipment.

Figure 6 shows the variation in boiler cost with varying pressures and sizes of boilers. The cost of steam generating equipment is shown in dollars per pound hourly steam generating capacity. It will be noted from this curve that a small boiler designed for a capacity of 20,000 pounds per hour will cost approximately $1.55 per pound of steam generating capacity if designed for 160 pounds pressure, and $1.95 per pound if designed for 450 pounds pressure. As the size of the boiler increases, the cost does not increase quite so fast with increase in pressure, and for a boiler of 100,000 pounds per hour capacity, the cost at 160 pounds pressure is 75 cents per pound of steam generating capacity, and for 850 pounds pressure the cost has increased to $1.20 per pound of steam generating capacity. The boiler cost curves have not been extended beyond the 850 pounds pressure range, as above this range boilers have not developed to a commercial standard and the price situation is rather indefinite. These cost curves show the trend with variation in pressures, but the actual boiler cost varies considerably with the market situation as well as with the type of equipment selected.

Fig. 7 shows the cost of standard turbo-generators of different sizes and for various steam conditions. Piping and auxiliary equipment, such as boiler feed pumps and steam specialties, represent a large part of the plant cost. It is difficult to establish a definite relationship between cost and pressure for these items, as prices are more dependent on the type of equipment selected than on pressure, but Fig. 8 gives a general picture of the variations in power plant first costs with different steam pressures, including all the equipment involved, and for three different sizes of plants. The complete plant costs have been segregated in the different main items in order to show their relative importance.

It should be kept in mind that these figures represent complete plant costs and that in many cases the actual costs will be considerably reduced due to use of existing buildings or other facilities, but even if this changes the total cost figures, it does not materially affect the relationship between the different pressures.

III. Annual Fuel Cost and Fixed Charges

The relative improvement in heat economy for different steam pressures, as well as the first cost of power plant, have been analyzed and it remains to combine the annual fixed charges and fuel cost in order to obtain a final comparison.

There is considerable difference of opinion as to what constitutes a proper percentage for fixed capital charges, which cover interest, depreciation, insurance, and taxes. Commonly used figures vary between eleven and fifteen per cent per year on the total capital expenditure, while in some special cases higher figures are used due to future uncertainties. It would seem that for power plant installations, fixed charges of 12 to 15 per cent should be fair assumptions, and both of these figures are used in preparing Fig. 9.

The estimated annual fuel costs are based on two different prices of coal, both with a heat value of 13,300 B.t.u. per pound; one taken at $4.00 per ton delivered, corresponding to 15 cents per million B.t.u.; and one taken at $2.67 per ton, corresponding to 10 cents per million B.t.u.

It has further been assumed that the annual capacity factor; that is, the ratio of average load to full capacity, approximates 70 per cent both for turbines and boilers, and that process steam and power requirements follow the same ratios for all plants. Variations from these assumptions may affect the actual annual fuel cost considerably, but they will not materially change the relationship of the different pressures, and the final comparisons of annual costs have therefore been expressed in dollars.

Operating labor and maintenance costs have not been included as they are more affected by local conditions than by pressure; but it should be borne in mind that both of these items will have a tendency to increase with increase in pressure even if they are not large enough to be a determining factor in the selection of plant steam pressure.

No attempt will be made to divide the annual fuel cost and fixed charges between power cost and process steam cost. For a given plant it is fairly easy to divide the fuel cost between power and process steam if one makes the assumption that all proc-

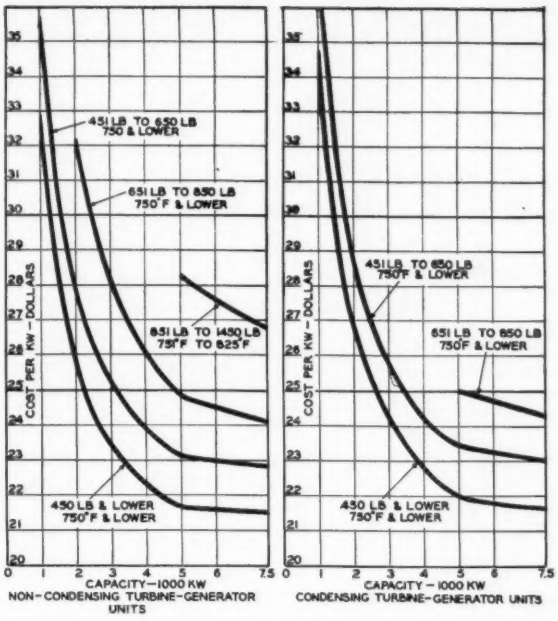

451 LB TO 650 LB 750 & LOWER
651 LB TO 850 LB 750°F & LOWER
851 LB TO 1450 LB 750°F TO 825°F
450 LB & LOWER 750°F & LOWER
COST PER KW - DOLLARS
CAPACITY - 1000 KW
NON-CONDENSING TURBINE-GENERATOR UNITS
CONDENSING TURBINE-GENERATOR UNITS

FIG. 7.

Cost Per KW. of Condensing and Non-Condensing Standard Turbine Generator Sets.

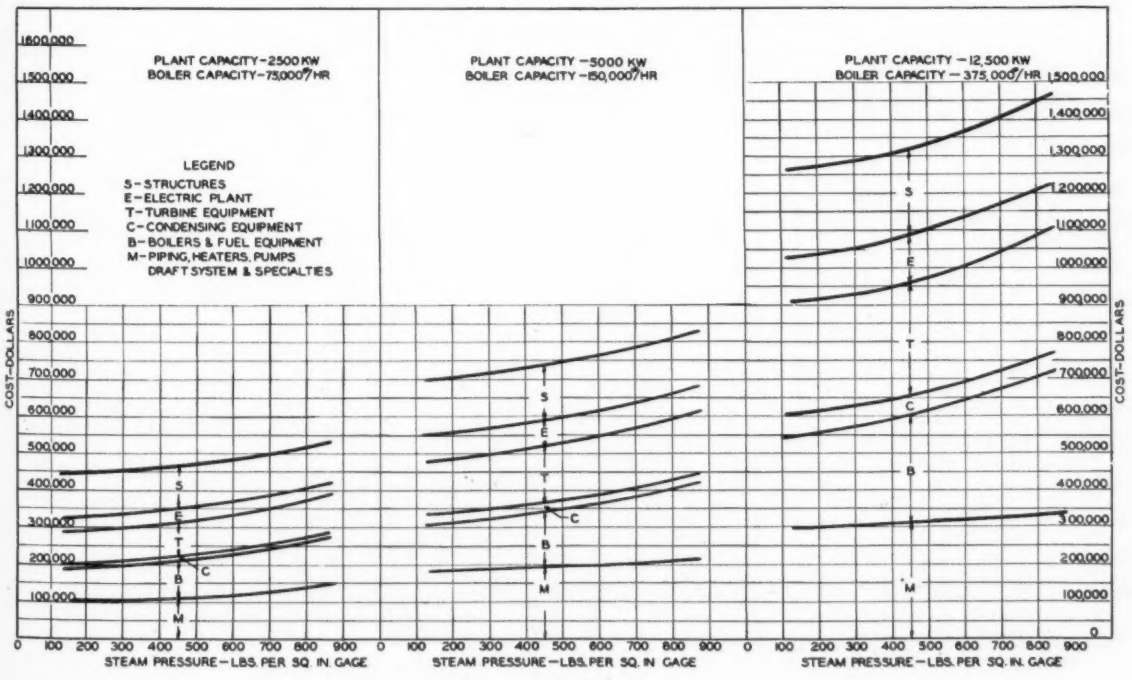


FIG. 8.

Construction Cost of Complete Turbine and Boiler Plants for Various Steam Pressures. Plants Designed for Two (2) Turbines and Two (2) Boilers.

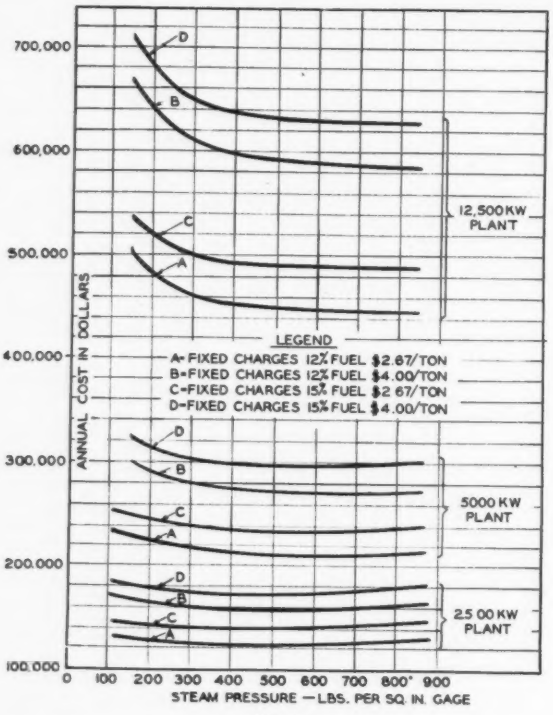


FIG. 9

Annual Combined Fixed Charges and Fuel Cost for Different Plant Sizes and Various Steam Pressures.

ess heat is charged at full heat value, or, in other words, that the generation of power gets the entire credit for the savings of "by-product power generation." but if these "mutual" fuel savings are to be divided between process steam and power, then the question can only be settled by an arbitrary division. It is difficult to properly allocate fixed charges on the power plant between power and process steam, as one also must estimate what the plant would have cost if there were no power generation, and in this case the boiler plant would be of entirely different design.

The annual fixed charges and fuel costs are shown in Fig. 9 for three sizes of plants. It will be noticed that as the steam pressure is increased, the combined annual cost goes down and reaches a minimum at a certain pressure which is different for each size of plant, and if the pressure is increased further, the combined cost starts going up again.

The relative merits of different steam pressures and the savings estimated in this paper are all based on the assumption that new and up to date equipment is installed. Naturally, if the savings are computed in relation to existing inefficient plants operated at low pressures, they will be considerably higher than those indicated above, and such savings must be estimated for each case.

General Conclusions

Before any general conclusions are made as to the relative merits of different steam pressures for a new plant, it should be emphasized that each installation is a problem in itself and can only be analyzed as such. Summarizing the above analysis, we arrive at the following general conclusions as to the most economical steam pressure for paper mill power plants:

1. For a new paper mill power plant with approximately 2500 kw turbine capacity and approximately 75,000 pounds per hour steaming capacity, the most economical steam pressure is between 400 and 450 pounds gauge.
2. With a turbine room capacity of 5,000 kw, and a boiler room steaming capacity of approximately 150,000 pounds per hour, the most economical steam pressure is between 600 and 650 pounds gauge, but the net annual saving after allowing for fixed charges over that which would be obtained with the 450 pound installation is small.
3. With a turbine room capacity of approximately 12,500 kw and a boiler room capacity of 375,000 pounds per hour, the maximum economy is obtained with a steam pressure approximating 850 pounds gauge, but the net savings over 650 pounds gauge are small.

Latest Development in Water Softening—Carbonaceous Zeolite*

by Ray Riley[1]

Abstract

A review of the application of zeolites for water softening with particular reference to a new carbonaceous zeolite.

Zeolites have been used for approximately 30 years in this country and abroad for water softening. This method of water softening has grown to be an industry of world-wide scope. In addition to their broad use for softening industrial waters for laundries, textiles, boiler feed and tanning purposes, etc., zeolites have a definite place in the field of water softening for general use, as in the home. hospital, office buildings and hotels. This is reflected in the enormous increase in the number of installations made for these purposes which now number over 200,000. One of the more recent trends in this field has been the use of zeolite for water softening purposes by municipalities in order to give entire communities the benefits of zeolite softened water. It is apparent that an industry which has faced such a substantial growth and broad application in the course of a few decades, must be founded on a process which has a number of distinct advantages over previously known methods.

* Presented at the Fall Meeting of the Technical Association of the Pulp and Paper Industry, Green Bay, Wis., Sept. 8-10, 1938.
[1] Chemical Engineer, The Permutit Co. New York, N. Y.

The term "zeolite" was originally a mineralogical name for a specific group of substances. But as now used in the water conditioning field, it has been broadened to include any hard granular material (through which the water percolates) which reacts chemically with the water, without going into solution, so that certain cations dissolved in the water, such as Ca, Mg, Fe, etc., are exchanged for cations in the zeolite, such as sodium, etc., and which may be regenerated by reversing the reaction in repeated cycles.

Until carbonaceous zeolite appeared, the zeolites were used primarily as sodium zeolites, and the cations were all basic so that the term "base exchange material" was often used instead of zeolites. Table I lists these older sodium zeolites and briefly gives their silica contents, weight per cubic foot, capacities, and characteristics. From this table it is to be noted that all of the older zeolites had in common a large amount of silica. They may therefore be classified as "siliceous zeolites."

The well known sodium zeolite reaction of softening is:

$$1)\quad \begin{matrix}Ca\\Mg\end{matrix}\Big\} \text{ salts} + Na_2Z^1 = \begin{matrix}Ca\\Mg\end{matrix}\Big\} Z + Na_2 \text{ salts}$$

The regeneration reaction is:

$$2)\quad \begin{matrix}Ca\\Mg\end{matrix}\Big\} Z + 2\ NaCl = Na_2Z + \begin{matrix}Ca\\Mg\end{matrix}\Big\} Cl_2$$

[1] Z signifies the negative radical of the zeolite.

Research has now given us carbonaceous zeolites as the latest member to be added to this group of zeolites which have been used in the past. Carbonaceous zeolites consist mainly of carbon. The carbonaceous zeolite Zeo-Karb now in commercial use is manufactured from coal by a treatment with chemicals which may include sulfuric acid or sulfur trioxide (SO_3), after which it is washed, stabilized and screened. Zeo-Karb is black, hard and granular. The silica content is somewhat less than that contained in the original coal and is therefore negligible.

When regenerated with sodium chloride a carbonaceous zeolite functions as a sodium zeolite. Its exchange capacity is 5,000-8,000 grains of hardness removal per cubic foot, depending on the relative amount of salt used for regeneration. It is completely resistant to aggressive attack by waters of low pH and can be used to satisfactorily soften either hard or relatively soft waters. A granular bed of Zeo-Karb offers litle resistance to the flow of water, and it can therefore handle high flow rates of 6 to 8 g.p.m. per square foot with very little loss of head. Since the exchange reaction is very rapid, completely softened water is obtained when operating at these high flow rates.

The concept of hydrogen zeolite is not new. However, the siliceous zeolites available until recently would not withstand mineral acids to convert them into hydrogen zeolites. The advent of the new carbonaceous zeolites, which can be used in the hydrogen cycle, because of their complete

TABLE I

SILICEOUS ZEOLITES

Popular Name	Weight per cu. ft. pounds	Exchange Capacity * gr. of $CaCO_3$ per cu. ft. of Zeolite	Per cent SiO_2	Remarks
Fused synthetic	50	4000-6000	50	First zeolite made. No longer used.
Precipitated synthetic (Decalso)	50	7500-10,000	60	Sensitive to aggressive waters. Suitable for clear hard water, over 10 gr./gal. hardness, where pH not below 6.8
Glauconite or greensand (Zeo-Dur)	90	2400-3000	45	More resistant to aggressive waters.
High-capacity greensand (Super-Zeo-Dur)	80	4000-5500	45	
Clay		5000-7000	50	Sensitivity similar to precipitated synthetic

* The range of capacity given corresponds to the usual range of amounts of salt used in regeneration (0.35 to 0.5 lb. salt per 1,000 grains of hardness removed). These are the ratings used in industrial practice. Laboratory softener tube tests give higher capacities.

TABLE II

ZEO-KARB H USED FOR REMOVING SODIUM BICARBONATE

	Well Water	Zeo-Karb H Effluent	75 per cent Zeo-Karb H and 25 per cent raw
	Chemical results in ppm.		
Total hardness as $CaCO_3$	0	0	0
X Methyl Orange Alkalinity as $CaCO_3$	460	0	45
Phenolphthalein Alkalinity as $CaCO_3$	20	0	0
X Chlorides as NaCl	89	89	89
X Sulphates as Na_2SO_4	62	62	62
Free Mineral Acidity as $CaCO_3$	0	95	0
Free CO_2 as CO_2	0	405	20
Total Solids (items X)	611	151	196

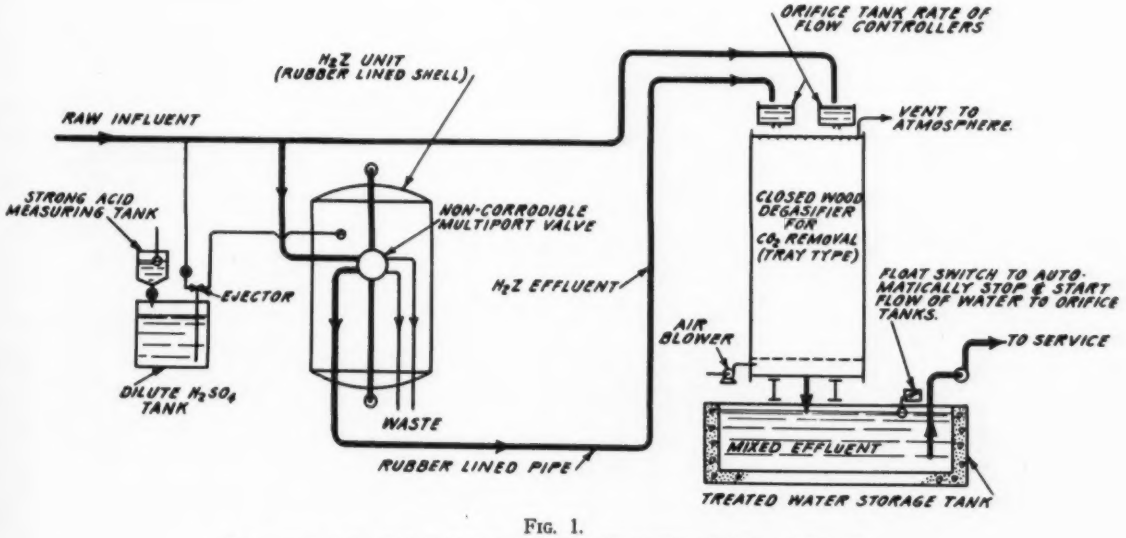


FIG. 1.

Arrangement of Zeo-Karb H Softener With Raw Water Neutralization and Degasifier.

resistance to acids, therefore ushers in a new chapter in zeolite water treatment and presents opportunity for a number of interesting applications. When hydrogen zeolite is used the hydrogen ion in the zeolite exchanges for the cations Ca, Mg, or Na in the water, according to the following general reactions:

$$3)\quad \left.\begin{matrix}Ca\\Mg\\Na_2\end{matrix}\right\}(HCO_3)_2 + H_2Z = 2H_2CO_3 + \left.\begin{matrix}Ca\\Mg\\Na_2\end{matrix}\right\}Z$$

$$4)\quad \left.\begin{matrix}Ca\\Mg\\Na_2\end{matrix}\right\}SO_4 + H_2Z = H_2SO_4 + \left.\begin{matrix}Ca\\Mg\\Na_2\end{matrix}\right\}Z$$

$$5)\quad \left.\begin{matrix}Ca\\Mg\\Na_2\end{matrix}\right\}Cl_2 + H_2Z = 2\,HCl + \left.\begin{matrix}Ca\\Mg\\Na_2\end{matrix}\right\}Z$$

The regeneration reaction is:

$$6)\quad \left.\begin{matrix}Ca\\Mg\\Na_2\end{matrix}\right\}Z + H_2SO_4 = H_2Z + \left.\begin{matrix}Ca\\Mg\\Na_2\end{matrix}\right\}SO_4$$

TABLE III

ZEO-KARB H USED FOR BOILER FEEDWATER CONDITIONING IN A PAPER MILL

	Chemical Results in ppm					
	Raw Water	After Zeo-Karb H	After Zeo-Karb H plus Alkali and 26 ppm Na_2SO_4	After Degasification	Sodium Zeolite and Acid and Degasification (comparative)	Hot Lime-Soda plus 77 ppm Na_2SO_4 (comparative)
Total hardness as $CaCO_3$	116	0–2	0–2	0–2	0–2	26
Ca hardness as $CaCO_3$	58	0–1	0–1	0–1	0–1	17
Mg hardness as $CaCO_3$	58	0–1	0–1	0–1	0–1	9
X Methyl Orange Alkalinity as $CaCO_3$	126	0	10	10	40	52
Phenolphthalein Alkalinity as $CaCO_3$	0	0	0	0	0	26
Free CO_2 as CO_2	7	118	109	8	10	0
X Chlorides as NaCl	3	3	3	3	3	3
X Sulphates as Na_2SO_4	7	7	33	33	129	84
Free mineral acidity as $CaCO_3$	0	9	0	0	0	
Total Solids (items X)	136	10	46	46	170	139
Ratio Na_2SO_4/Na_2CO_3	...	...	3.0	3.0	3.0	3.0

	Chemical Costs		
	Lb./1000 gal.	Cost/lb., cents	Cost/1000 gal., cents
Zeo-Karb			
Acid	1.35	1.0	1.35
Sodium hydroxide	0.14	2.0	0.28
Sodium sulphate	0.22	1.5	0.33
			1.96
Zeolite and Acid			
Salt	3.15	0.5	1.58
Acid	0.77	1.0	0.77
			2.35
Hot Lime-Soda			
Lime	1.15	0.6	0.69
Soda Ash	0.13	1.5	0.20
Sodium sulphate	0.64	1.5	0.96

Phosphate is also added as a secondary treatment but is not included in the above because it would be common to all three methods of treatment.

TABLE IV

ZEO-KARB H AND SODIUM ZEOLITE USED FOR BOILER FEED TREATMENT IN A PAPER MILL

	Chemical Results in ppm					
	Raw Water	After Zeo-Karb H	After Na_2Z	Mixture 65% Zeo-Karb H 35% Na_2Z and degasification	After adding 21 ppm Na_2SO_4	Hot Lime-Soda plus 57 ppm Na_2SO_4 (comparative)
Total hardness as $CaCO_3$	90	0–2	0–2	0–2	0–2	26
Calcium hardness as $CaCO_3$	58	0–1	0–1	0–1	0–1	17
Magnesium hardness as $CaCO_3$	32	0–1	0–1	0–1	0–1	9
X Methyl Orange Alkalinity as $CaCO_3$	82	0	82	15	15	52
Phenolphthalein Alkalinity as $CaCO_3$	0	0	0	0	0	26
Free CO_2 as CO_2	5	77	5	10	10	0
X Chlorides as NaCl	5	5	5	5	5	5
X Sulphates as Na_2SO_4	27	27	27	27	48	84
Free Mineral Acidity as $CaCO_3$	0	21	0	0	0	0
Total Solids (items X)	114	32	114	47	68	141
Ratio Na_2SO_4/Na_2CO_3	...	..	0.3	1.7	3.0	3.0

	Chemical Costs		
	Lb./1000 gal.	Cost/lb., cents	Cost/1000 gal., cents
Zeo-Karb			
Salt	0.82	0.5	0.41
Acid	1.0	0.75	0.75
Sodium Sulphate	0.18	1.5	0.27
			1.43
Hot Lime-Soda			
Lime	0.75	0.60	0.45
Soda Ash	0.29	1.5	0.43
Sodium Sulphate	0.48	1.5	0.72
			1.60

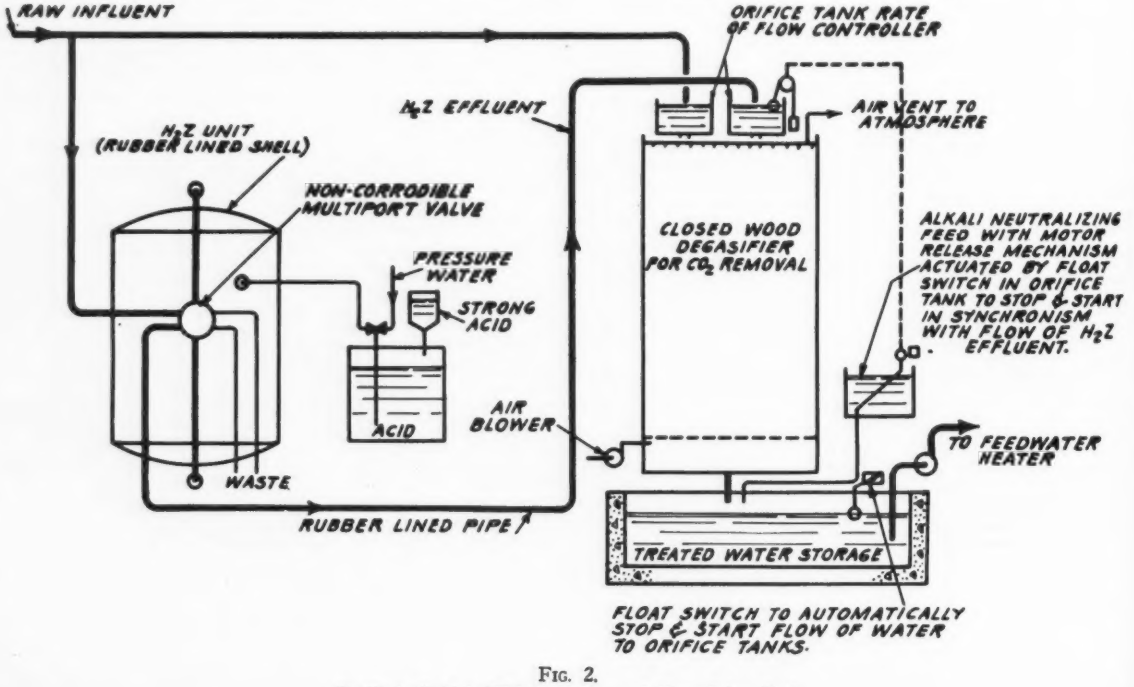

RAW INFLUENT
ORIFICE TANK RATE OF FLOW CONTROLLER
H_2Z EFFLUENT
AIR VENT TO ATMOSPHERE
H_2Z UNIT (RUBBER LINED SHELL)
NON-CORRODIBLE MULTIPORT VALVE
CLOSED WOOD DEGASIFIER FOR CO_2 REMOVAL
ALKALI NEUTRALIZING FEED WITH MOTOR RELEASE MECHANISM ACTUATED BY FLOAT SWITCH IN ORIFICE TANK TO STOP & START IN SYNCHRONISM WITH FLOW OF H_2Z EFFLUENT.
PRESSURE WATER
STRONG ACID
ACID
AIR BLOWER
TO FEEDWATER HEATER
WASTE
RUBBER LINED PIPE
TREATED WATER STORAGE
FLOAT SWITCH TO AUTOMATICALLY STOP & START FLOW OF WATER TO ORIFICE TANKS.

FIG. 2.
Zeo-Karb H Unit With Degasifier and Neutralizing Feed.

The cation exchange capacity of hydrogen zeolite (Zeo-Karb H) is 5,000-12,000 grains (the sum of Ca, Mg and Na cations, all expressed as $CaCO_3$) per cubic foot when regenerated with sulfuric, hydrochloric or carbonic acid, depending upon the type and amount of acid used for the regeneration. The amount of acid required for regeneration varies to some extent with the composition of the raw water.

Since the hydrogen in hydrogen zeolite is not a base, it is improper to speak of the reactions (3) to (6) as "base exchange" reactions. Therefore, it is advisable to use the terms "cation exchange" and "cation exchanger" since all the reacting ions are cations. The "cation exchangers" can be divided into two groups:

a) Base exchangers—those which exchange basic cations, such as sodium ions, of the material for the calcium and magnesium ions in the water and the reverse when regenerated with a sodium salt like NaCl.

b) Hydrogen exchangers—those which exchange the H-ion of the material for the Ca, Mg and Na-ions in the water, and the reverse when regenerated with an acid like H_2SO_4.

The carbonaceous "base exchangers" have found the following applications for water softening:

1) With waters of low pH value (under 6.5), where it is desired to soften such waters at these low pH values.

2) With waters high in iron. Carbonaceous zeolites offer certain advantages in the removal of ferrous iron from water by cation exchange.

3) Limited space for softeners. Where space available for softeners is limited. Because of greater exchange per cubic foot smaller Zeo-Karb units can be used instead of a larger softener employing zeolites of lower exchange capacity which permit lower flow rates.

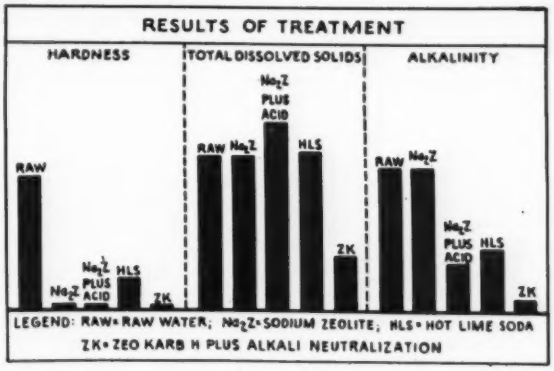


CHART 1.

4) Waters low in SiO_2. This is particularly applicable in the power plant for boiler feed.

5) Softening after silica removal. When the silica is reduced by suitable treatment, the effluent of the silica removal plant will be low in silica and will tend to pick up silica from siliceous zeolites. Zeo-Karb Na makes it possible to remove completely the residual hardness in low silica waters by the base exchange process without any danger of silica pickup.

Time does not permit a detailed discussion of each of the above applications of carbonaceous base exchangers. Detailed information for each of these applications is given in Applebaum's *1* article.

The carbonaceous "hydrogen exchangers" accomplish two novel effects by reaction (3) given above:

1) *Removal of Sodium Bicarbonate.* It will be noted from reaction (3) above that hydrogen zeolite converts sodium bicarbonate into carbonic acid which can be removed from water with a cold degasifier or a heater. Thus, the sodium bicarbonate is completely removed from the water. Here-

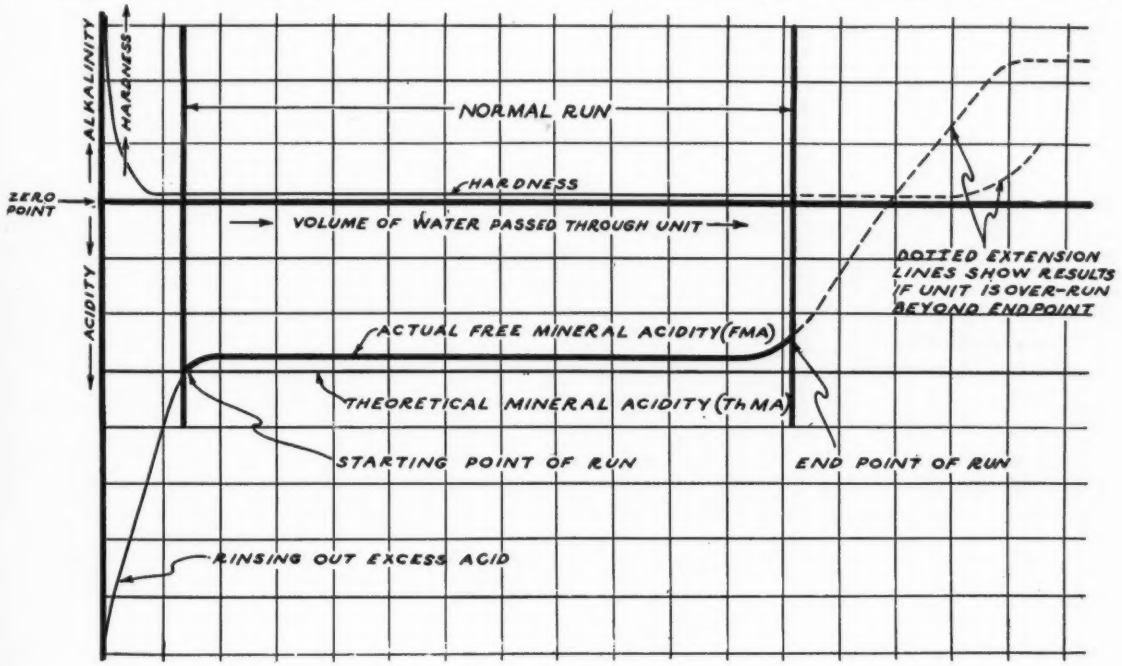


FIG. 3.
Characteristic Curve For Zeo-Karb H Effluent.

tofore, the only known method of removing sodium bicarbonate from water was distillation. Hydrogen zeolite is the first chemical method to accomplish this result. Since there are many municipal and private water supplies that contain objectionable quantities of sodium bicarbonate, hydrogen zeolite offers an advantageous method of conditioning such water.

2) *Removal of Calcium and Magnesium Bicarbonate.*

Reaction (3) also shows that hydrogen zeolite converts calcium and/or magnesium bicarbonate into carbonic acid which is removable by cold degasification or with a heater. Sodium zeolite merely converts the calcium and magnesium bicarbonate into sodium bicarbonate. Thus, hydrogen zeolite goes a step further and not only effects the removal of calcium and magnesium cations as completely as does zeolite but also the bicarbonate anion and performs both functions simultaneously.

Sodium Bicarbonate Removal*(2)*

Case No. 1 illustrates the use of Zeo-Karb to remove sodium bicarbonate from a raw water free from hardness. The water comes from a well 1000 feet deep. Table II shows the composition of the water at the various stages of treatment.

Fig. 1, a flow diagram of this plant shows the typical arrangement of a Zeo-Karb unit with raw water neutralization and a degasifier. This type of equipment is particularly applicable where the raw water is free from hardness or where the amount of hardness in the final effluent introduced by the raw water used for neutralization is not objectionable. This type of equipment is also suitable for conditioning water for cooling systems.

Removal of Calcium, Magnesium and Sodium Bicarbonate Boiler Feedwater Treatment

In the pulp and paper industry, as in many other industries, one of the most important problems is the conditioning of the boiler feedwater. In boiler feedwater treatment it has been the continuous endeavor of chemists and engineers to aim at attaining the minimum hardness, and total solids simultaneously with a minimum residual alkalinity in the treated water. The earliest method used was the cold lime-soda treatment. With this method it is possible to reduce the hardness to about 70 p.p.m. as $CaCO_3$ with an excess of soda ash of about 35 to 50 p.p.m. The next step was to heat the water to accelerate the chemical reactions and drive them further toward completion—the hot lime soda softener. With this method of treatment it is possible to reduce the hardness to between 17 and 26 p.p.m. with an excess of soda ash of 26 to 34 p.p.m.

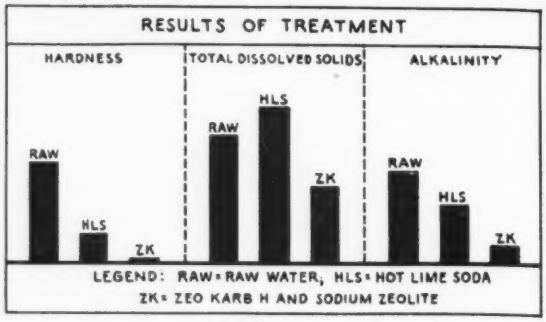


CHART 2.

Next, sodium zeolite treatment was developed and used because the hardness is reduced practically to zero. But, as pointed out above, the bicarbonates of calcium and magnesium are converted in sodium bicarbonate, so that the alkalinity is not reduced. Therefore, in many plants sulphuric acid feeds are added after the sodium zeolite to convert the sodium bicarbonate to sodium sulphate. In some plants, cold lime treatment followed by acid precedes the zeolite.

Hydrogen zeolite is a recent advance step in the chemist's endeavor to produce a treated water of minimum hardness, alkalinity and dissolved solids. During recent years, a considerable number of boiler plants have adopted this form of treatment. Because of the fact that the pulp and paper industry is one of the most progressive industries in the country,

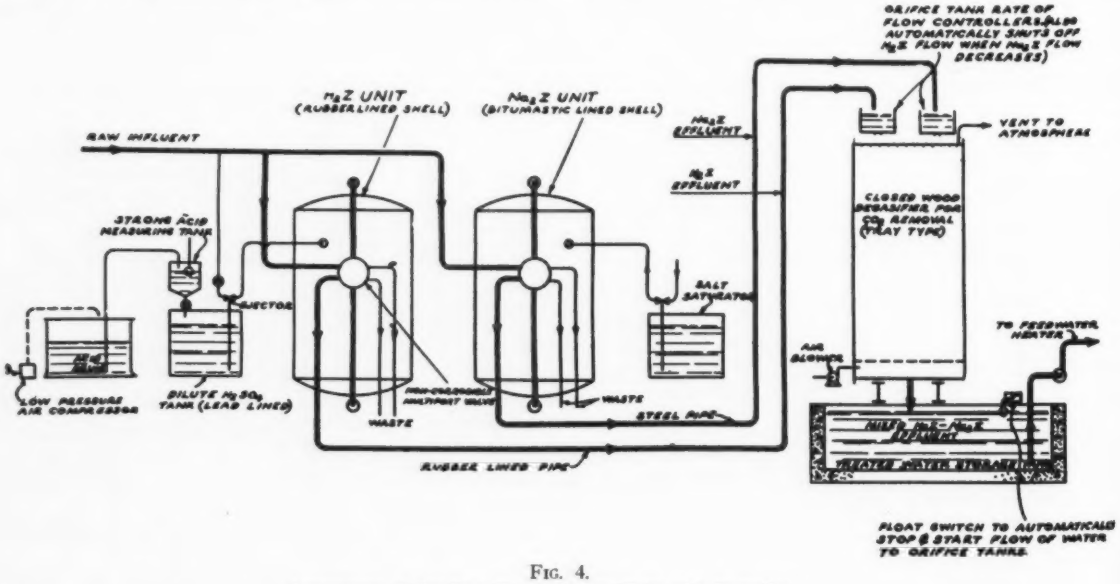

ORIFICE TANK RATE OF FLOW CONTROLLER SHUTS OFF AUTOMATICALLY
RAW INFLUENT
STRONG ACID MEASURING TANK
EJECTOR
LOW PRESSURE AIR COMPRESSOR
WASTE
STEEL PIPE
RUBBER LINED PIPE
VENT TO ATMOSPHERE
CLOSED WOOD DEGASIFIER FOR CO_2 REMOVAL (TRAY TYPE)
SALT SATURATOR
AIR BLOWER
TO FEEDWATER HEATER
FLOAT SWITCH TO AUTOMATICALLY STOP & START FLOW OF WATER TO ORIFICE TANKS

FIG. 4.
Arrangement of Zeo-Karb H and Sodium Units with Degasifier.

it readily adopted this new form of treatment and there are several Zeo-Karb softeners installed to treat boiler feedwater in pulp and paper plants.

Further in our discussion case histories will be given of three such plants operating on different types of water in order to illustrate the flexibility of the use of hydrogen zeolite for conditioning boiler feedwater.

Control of Alkalinity in Zeo-Karb Effluents

Before starting with the case histories, it is advisable to briefly discuss the means of controlling alkalinity in Zeo-Karb effluents. As reactions 4 and 5 show, the sulphates and chlorides in the raw water are converted to equivalent amounts of sulphuric acid and hydrochloric acid in the effluent of hydrogen zeolite units. ThMA is the designation for the free mineral acidity theoretically equivalent to the chlorides and sulfates in the raw water. The actual acidity in the effluent of a hydrogen zeolite unit is termed free mineral acidity (FMA) and remains fairly constant throughout the run. Fig. 3 is a typical curve of performance. It will be noted from Fig. 3 that as the regeneration acid is rinsed out, the acidity of the effluent decreases to a point slightly below the ThMA, the actual FMA then continues constant until near the end of the run, when it begins to decrease. The run is ended, and the Zeo-Karb H is regenerated when the FMA of the effluent decreases an appreciable extent. It will be noted also that the hardness in the effluent from the hydrogen zeolite units remains practically at zero throughout the run, in fact, when regeneration takes place due to the drop in FMA, there is usually still additional capacity for hardness removal left, as indicated by this typical curve.

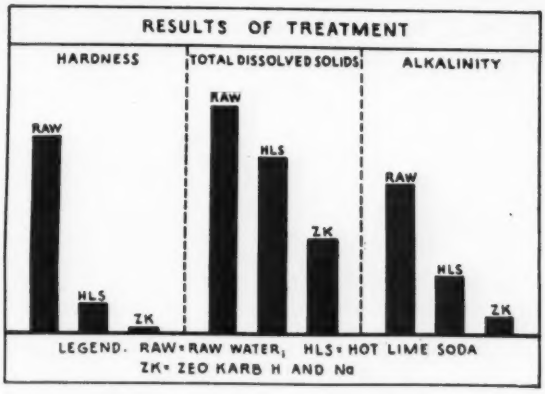


CHART 3.

The alkalinity of the water from a Zeo-Karb plant can be controlled by:

1) Neutralizing with alkali
2) Neutralizing with a softened water containing sodium bicarbonate.
3) Bypassing raw water

When the free mineral acidity in the effluent of the hydrogen zeolite is low, i.e. when the chlorides and sulphates in the raw water are low, it is often economical and advisable to use an alkali feed such as caustic soda, soda ash, sodium phosphate, etc., for controlling the alkalinity of the water from the hydrogen zeolite plant.

Where the raw water contains appreciable sulphates and chlorides it is more economical to provide a sodium zeolite unit operating in parallel with the

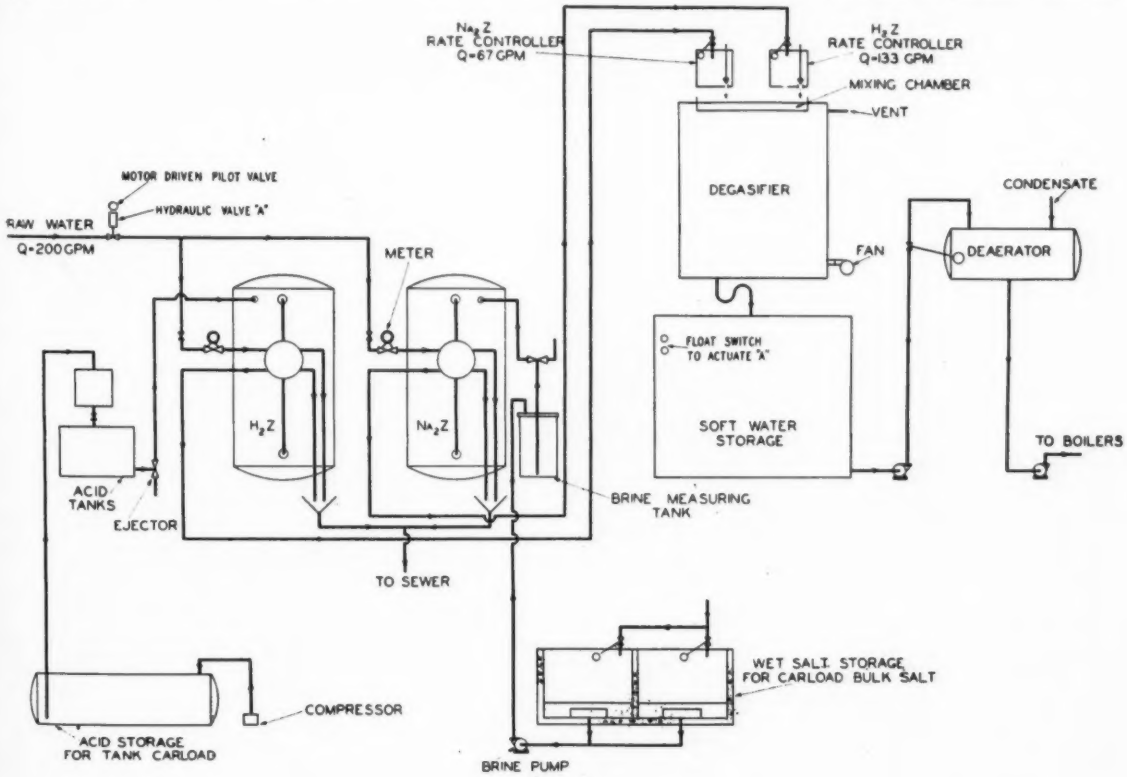


FIG. 6
Case 5 Zeo-Karb H Plant.

hydrogen unit. Then, the sodium bicarbonate in the effluent of the sodium zeolite unit neutralizes the FMA in the effluent of the hydrogen unit as the two effluents are mixed. The proportion of the total water to be passed through each of the units is calculated from the anaylsis of the raw water and the formula for the proportion that passes through the hydrogen unit is as follows:[3]

$$\text{Per cent through } H_2Z \text{ unit} = \frac{100 \times A_r - A_m}{A_r + FMA}$$

Where A_r represents methyl orange alkalinity (expressed as $CaCO_3$) in the raw water, A_m represents the desired methyl orange alkalinity in the final mixed effluent. FMA represents the free mineral acidity (expressed as $CaCO_3$) in the hydrogen zeolite effluent.

All that is required to maintain a constant alkalinity in the final mixed effluent is to control the rates of flow of the hydrogen and sodium zeolite units in the correct proportion to each other.

The following is a typical illustration of a hydrogen zeolite plant with a degasifier and alkali neutralizing feed.

This is a new boiler plant, boiler pressure 625 pounds—makeup 50-100 per cent. The water comes from a spring and is passed through a Zeo-Karb H unit, a degasifier and then into a deaerator. Table III gives the analysis of the water at various stages of treatment. This table also includes the probable analysis if a hot lime soda plant had been installed. The total dissolved solids after the Zeo-Karb treatment are 46 p.p.m. and after hot lime soda would have been 139 p.p.m. due to the higher alkalinity of the hot lime soda effluent and the larger amount of sodium sulphate which would have to be added to establish a 3:1 sulfate-carbonate ratio. Chart 1 shows the relation between the dissolved solids, hardness, and alkalinities obtainable by each of the three methods which can be successfully used for conditioning this type of water for use in a high pressure boiler plant. Fig. 2 illustrates the general arrangement of the water conditioning equipment at this plant. Trisodium phosphate plus caustic soda are added to neutralize the mineral acidty.

The following is a typical illustration of a hydrogen zeolite plant consisting of a Zeo-Karb H, sodium zeolite unit and a degasifier.

This is a boiler plant in a paper mill, boiler pressure 400 pounds—makeup 50 per cent. The entire boiler feedwater makeup was formerly softened with a sodium zeolite plant. When the question of expanding the boiler plant came up it was decided to use hydrogen zeolite to soften the additional boiler feedwater. Thus, it was possible to utilize their complete zeolite plant and by the addition of the hydrogen zeolite unit, increase the capacity of their water conditioning plant and simultaneously improve the quality of the water by producing a water of zero hardness with a much lower alkalinity and dissolved solids.

Table IV gives the analysis of the water at various stages of treatment. This table also includes the probable analysis of a hot lime-soda plant that was considered before selecting the hydrogen zeolite unit to operate in parallel with the existing sodium zeolite plant. The total dissolved solids after the hydrogen zeolite treatment with adjustment for a sulphate carbonate ratio of 3:1 are 68 p.p.m. and after hot lime soda would have been 141 p.p.m. Chart 2 shows the relation between the dissolved solids hardness and alkalinity of the raw water and after treatment with hot lime-soda and hydrogen zeolite and adjusted to a 3:1 sulphate—carbonate ratio for use in this particular boiler plant.

TABLE V

ZEO-KARB H AND Na USED FOR BOILER FEED TREATMENT IN A PAPER MILL

Chemical results in ppm

	Filtered River	After Zeo-Karb H	After Zeo-Karb Na	Mixture 33% Na 67% H before Degasification	After Degasification	Hot Lime-Soda plus 38 ppm Na_2SO_4 (comparative)
Total hardness as $CaCO_3$	175	0–2	0–2	0–2	0–2	26
Ca hardness as $CaCO_3$	105	0–1	0–1	0–1	0–1	17
Mg hardness as $CaCO_3$	70	0–1	0–1	0–1	0–1	9
X Methyl Orange Alkalinity as $CaCO_3$	134	0	134	15	15	52
Phenolphthalein Alkalinity as $CaCO_3$	0	0	0	0	0	26
Free CO_2 as CO_2	15	133	15	120	10	0
X Chlorides as NaCl	22	22	22	22	22	22
X Sulphates as Na_2SO_4	46	46	46	46	46	84
Free Mineral Acidity as $CaCO_3$	0	45	0	0	0	0
Total Solids (items X)	202	68	202	83	83	158
Ratio Na_2SO_4/Na_2CO_3	...	...	...	3.0	3.0	3.0

Chemical Costs

	Lb./1000 gal.	Cost/lb., cents	Cost/1000 gal., cents
Zeo-Karb			
Salt	1.66	0.5	0.83
Acid	1.83	1.0	1.83
			2.66
Hot Lime-Soda			
Lime	1.28	0.6	0.77
Soda Ash	0.58	1.5	0.87
Sodium Sulphate	0.31	1.5	0.46
			2.10

Fig. 4 illustrates the general arrangement of Zeo-Karb H and sodium zeolite units with degasifier. This arrangement is especially applicable when the boiler feed is now being softened with sodium zeolite and the addition of a hydrogen unit increases the capacity of the plant and improves the quality of the zero hardness water by decreasing the dissolved solids and reducing the alkalinity to any predetermined figure. This general type of plant is to be recommended where the acidity of the hydrogen unit is high enough so that it is not economical to neutralize with an alkali feed. It is much cheaper to neutralize the hydrogen zeolite effluent with the alkalinity in sodium zeolite softened water than to add expensive alkali for this purpose.

Recently a local paper mill (Northern Paper Company, Green Bay, Wis.) purchased a hydrogen zeolite plant consisting of Zeo-Karb H and Na units with degasifier for conditioning the Fox River Water for their new 650-pound pressure boilers. Fig. 6 illustrates the general arrangement of this plant. Sixty-seven per cent of the water will be passed through the hydrogen unit and thirty-three per cent through the sodium unit. The mixture will then pass through a degasifier where the CO_2 is to be reduced from 120 to 10 p.p.m. and then the degasified water will flow into the storage tank on its way to the deaerator. Acid and salt will be purchased and stored in carload lots to reduce operating costs to a minimum.

Table V gives the anticipated analysis of the water at various stages of treatment. In this table is also included the anticipated analysis of the

treated water if a hot lime soda plant were operating on a water of this type after addition of the necessary sodium sulphate to establish a 3:1 sulphate-carbonate ratio. Chart 3 gives a graphical representation of the figures in Table V.

Anion Removal

With hydrogen zeolite it is possible to completely remove the calcium and magnesium cations and the removal of bicarbonate anion is effected by degasification of the hydrogen zeolite treated water by removal of CO_2. The removal of sodium cations is proportional to the removal of bicarbonate anions after allowing for the bicarbonate equivalent to the calcium and magnesium cations removed. The next step is a zeolite for the removal of the chloride and sulphate anions. This step has already been under investigation for several years, *(1, 4, 5)*.

This anion removal is accomplished by a two step process, which process we call "Demineralizing."

Step No. 1. The raw water is passed through a hydrogen zeolite which removes the cations and converts the anions into the corresponding acids, i.e. carbonic, sulphuric and hydrochloric acids according to reactions (3), (4) and (5) above.

Step No. 2. The acid effluent of step No. 1 is passed through an organic acid removing material which removes the sulphuric and hydrochloric acids. The effluent from the acid removing material is low in alkalinity, sulphates and chlorides and high in carbon dioxide. The carbon dioxide can be removed by degasification exactly like it is in a hydrogen zeolite plant.

The acid removing material is a granular product which is regenerated with alkali, NaOH, Na_2CO_3, NH_4OH etc., when its acid removal capacity is exhausted.

A number of two step "demineralizing" plants have been installed in various parts of the country operating on different types of waters. After a successful proving period in the field this method will be available for commercial usage to produce a water containing only a few p.p.m. dissolved solids.

Literature Cited

(1.) Applebaum, S. B., "Applications of Carbonaceous Zeolites to Water Softening". *J. Am. Water Works Assoc.*, 30: 947-978 (1938).
(2.) Applebaum, S. B. and Riley, Ray, "Zeo-Karb H—A new Method of Conditioning Water to Remove Sodium Bicarbonate Chemically instead of by Distillation." *Ind. Eng. Chem.*, 30: 80-82 (1938).
(3.) Tiger, H. L., "Carbonaceous Zeolites—An Advance in Boiler Feedwater Conditioning". Trans. A.S.M.E. 60: 315-325 (1938).
(4.) Adams, B. A., and Holmes, E. J., "Adsorptive Properties of Synthetic Resins." *J. Soc. Chem. Ind.*, 54 No. 1, P 6T (1935).
(5.) Bird, P. G., Kirkpatrick, W. H., and Halof, Easton, "Removal of Dissolved Mineral Solids from Water by Organic Exchange Filters," *J. Am. Water Works Assoc.* 29: 1526-1532 (1937).

The Washing of Bleached Sulphite and the Introduction of a New Method for its Control*

By Herbert Prelinger[1]

Abstract

This paper introduces a new analytical method for inspection of the efficiency of removal of the bleaching residues in the washing of bleached pulps. The author endeavors to establish basic data which may prove helpful for developing a control system in practical mill operation.

Introduction

In recent years, the washing of bleached pulps has assumed an importance equal to that of the bleaching itself. The most efficient bleaching might produce an unattractive sheet in case the products of the bleaching reactions are incompletely removed by washing. Pulp of such quality is exposed to a serious reversion in color.

Generally speaking, bleached pulp of any origin has the tendency to revert in color when stored. We differentiate between two types of color reversion, one resulting from the presence of bleaching residues not thoroughly removed, the other one resulting from chemical-physical changes in the cellulose-lignin complex.

Whether these two phenomena proceed independently of each other, or whether there is a connection between the two is not known at the present time. The mechanism of the color reversion is not at all clear. The solution of this problem will not be reached until our knowledge of the lignin complex is more completely established.

If we talk about color reversion of bleached pulp in connection with bleaching, then we assume that this type of reversion is attributable to retained impurities, incompletely removed from the fibrous material. Additional washing given a pulp already reverted in color will in most cases produce no higher color, because the residual impurities contained in the reverted pulps seem to behave chemically quite differently than those in pulps immediately after bleaching. In the case of impurities sufficiently rendered removable by the bleaching, the oxidized and chlorinated coloring matters are in such a state that a thorough washing will result in their more or less complete removal. In case of reverted pulp, however, we are not able to remove the retained impurities by additional washing. We safely may assume that a chemical change of the residuals must have taken place. The oxidized products being of unstable characteristics are probably reduced again to deeper colored substances and precipitated on the fibers from which they cannot be removed by washing. Their presence is very objectionable since they discolor the pulp. However, when such pulp is treated with small amounts of bleach liquor, the

* Presented by title at the Fall Meeting of the Technical Association of the Pulp and Paper Industry, Green Bay, Wis.
[1] Member TAPPI, Research Chemist, Camas Mill, Crown Zellerbach Corporation, Camas, Wash.

residuals are oxidized again, rendered soluble and can be now removed by washing. A detailed study of the color reversion giving experimental evidence of the mechanism would be of greatest theoretical interest and probably beneficial to practical mill operation.

Directly after completion of the bleaching we find in the adhering residual water inorganic and organic substances in solution. The inorganic compounds are introduced by the bleach liquor. The organic substances, the oxidation and chlorination products and colloids originating from the non-cellulosic constituents of the pulp, are rendered soluble during the bleaching. In removing these substances from bleached pulps by washing it is well known that the electrolytes behave to some extent differently from the non-electrolytes. The electrolytes are quicker and more thoroughly removed by washing than the organic compounds. The reason for that lies in the lower adsorption power of the cellulose fibers for electrolytes. Considering the process of washing alone, we have to deal with two phenomena, adsorption and diffusion. The mechanism of the adsorption is in our case probably purely physical. Generally speaking the forces acting in adsorption are determined by three factors, namely:

(1). The surface of the solid absorbent.
(2). The concentration of the substance being absorbed in solution.
(3). The nature and characteristic of the adsorbent and that of the substance being adsorbed. In case of fibrous material as an adsorbent, temperature, also may play an essential part.

Cellulose fibers possess a very large surface which is formed by the external layer of the fibers and by the interior area, the fibrils and micelles. From a physical standpoint, cellulose might be considered as a system of extremely fine and extended capillary tubing. The high adsorption power of cellulose for colloids and electrolytes is due to the action of this capillary system. It is known that organic substances are more intensely adsorbed and intimately retained by the fibers than the electrolytes. This is significant in the operation of washing pulp and its control. Adsorption, in the writer's opinion also might be affected by something of the nature of a frictional resistance.

The second phenomenon we meet in washing pulp is the diffusion. The pulp, after bleaching is saturated with the organic and inorganic impurities in solution. These bleaching products must be removed by washing as thoroughly as possible in order to minimize the chances of color reversion.

If the pulp after bleaching is sent immediately from the dumping chest over the washer, then we will find a pulp whose washing is confined largely to the removal of the merely absorbed products of the bleaching, while those adsorbed to the fibre surfaces are scarcely affected. Such pulp when kept in storage shows in a few hours remarkable retrogression in color. This color reversion is due to the fact that the soluble impurities located in the internal surface of the fibers, in the area between the fibrils could not diffuse to the external layers previous to the washing, and consequently are not removed by the washing to follow.

In order to insure proper washing, it is therefore of great importance to soak the bleached pulp at relatively low consistency for a certain length of time and under constant agitation previous to its washing. By doing this, the pulp is placed in such a state that the residual liquid can diffuse from the internal to the external surface of the fibers.

Diffusion is a slow process, its rate varies with the concentration of the impurities in solution and with the nature of the impurities. Colloids, for instance, diffuse remarkably slower than electrolytes. In order to accelerate the diffusion, the osmotic pressure in the capillaries of the fibrous system has to be higher than that of the outside liquid. This is accomplished by producing a high concentration gradient between the liquid contacting the outside surface of the fibers and that inside of the fibers. In other words, the rate of diffusion will be greater when the residual liquid adhering to the outside is removed and replaced by fresh water.

These considerations of the principles of diffusion, which cannot be avoided here, lead to the principle of washing pulp successfully, which is, first, removing the residual liquor as thoroughly as possible from the pulp without the use of fresh water, and second, diluting the thusly treated pulp with fresh water to a low consistency. By the second step, the fibrous material is placed in such a state that the difference of the osmotic pressures becomes a maximum, producing the desired conditions for rapid diffusion.

Consideration of the foregoing paragraphs illustrates that diffusion under proper conditions has to precede the washing. The act of diffusion is initiated by soaking the fibrous material in water under certain definite conditions.

These conditions are:

(1) Low consistency of the pulp. A consistency of 0.8 per cent might be considered as the upper limit.
(2) Proper agitation during the soaking period.
(3) Sufficient time of reaction.

The length of time given for soaking is of greatest importance. Diffusion is a time consuming procedure which never should be neglected in favor of saving time. Saving of time in this case must be repaid with the production of a pulp showing a strong tendency to revert in color.

The majority of cases of color reversion pulp are due to the lack of proper handling of the pulp previous to washing. In case of insufficient and improper soaking, the bleaching residues diffuse incompletely from the inner surface (lacuna) of the fibers to the outside layers. Consequently, they are not completely removed by the mechanical act of washing. Such pulp when stored, either wet or dried reverts quickly and seriously in color. This demonstrates clearly that insufficient soaking adds to the difficulty of attaining pulp of a stable and high white color.

The question arises now by what means must we determine the efficiency of the washer and the degree of washing of bleached pulp? This subject although being of greatest interest and importance to practical mill operation has received relatively little attention. The two conventional methods of determining the efficiency of washing are based either on the ash content of the washed pulp or on the degree of its color reversion. Neither method although frequently in practical use will produce reliable results from which definite practical conclusions can be drawn.

Degree of color reversion cannot be an entirely useful measure of washing efficiency because it may be due either to poor washing, to insufficient bleaching or both, and therefore, must be considered as a rather poor means of controlling the washer opera-

tion. The second means that we have, the ash content does not represent an ideal way of washer control as pointed out by the following paragraph.

The bleaching residues to be removed by washing from the pulp consist of the organic oxidation and chlorination products and of the inorganic salts derived from the bleach liquor. The effect of washing upon the organic substances is different from that on the electrolytes. We have to repeat that the organic substances, the colloids, are much more intensely absorbed by the fibrous material than the electrolytes. From this it follows that organic substances persist in being retained to a certain extent while the removal of the inorganic salts is practically completed. In other words, bleached pulp might show a low ash content and still be poorly washed as regards its organic impurities, and consequently as regards its color reversion.

The slow process of removing the organic residues in comparison to that of the electrolytes is not only due to the high adsorption power of the fibrous material for colloids but also due to the slow diffusion which is characteristic for these residues.

These considerations are of great importance from the standpoint of practical washer control. In mill practice, the observation of low ash contents in connection with considerable color reversion is frequently made with bleached pulps. This observation is in distinct contrast to the usual assumption that a low ash content serves as the criterion for properly washed pulp. Experimental work along this line, however, will show in a later section of this paper that the ash content of bleached pulp and the degree of washing do not necessarily agree with each other. This is explained by the various rates of diffusion of electrolytes and non-electrolytes.

The foregoing discussion, it is hoped, has demonstrated that neither of the two commonly used methods is suitable for furnishing reliable information concerning the degree of washing. Furthermore it emphasizes the need for a practical and reliable method.

Objectives and Principle of Proposed Procedure

A suitable method of controlling the process of washing should measure the amount of the impurities still retained in the pulp after being washed. The impurities, as referred to in foregoing paragraphs are of organic and inorganic nature. A control system based on the determination of the inorganic matter—the determination of the ash—has been discussed to be of little reliance. It is, therefore, logical to take the amount of the organic impurities left in the pulp as a measurement of the degree of washing. The method investigated in this paper is based on this principle. The amount of the organic matter left in the pulp is determined and serves as the criterion of the degree of washing.

The organic substances are determined by the amount of oxygen demand required for their complete oxidation to carbon dioxide. The oxidation of the organic residues may be symbolized by the following equation:

$$Cn(H_2O)m + 2nO = nCO_2 + mH_2O$$

This method is based on the oxidation of a certain quantity of the pulp water retained by the pulp by means of a known but excessive amount of a suitable agent. After completion of the oxidation the excess amount is determined from which result the actual oxygen consumption is calculated.

It is obvious that the amount of oxygen consumed is in direct relationship to the amount of the organic residues, and therefore may serve as the measurement of the impurities. The organic residues retained in the water of the pulp, therefore, are expressed in terms of oxygen. In using the oxygen demand as a means of control, the author has adopted the term "oxygen number" which value refers to the number of milligrams of oxygen consumed by 100 cc. of the residual water.

A quantitative method for determining the organic matter by means of oxidation should be relatively simple and involve as few manipulations as possible.

First, potassium permanganate was chosen as the oxidizing agent. Investigation with this reagent, however, has shown its unfitness for this special type of work. In spite of observing exact working conditions, no duplication in results could be obtained. Similar unfavorable conditions were met using potassium dichromate. Finally, in potassium iodate an excellent means was found which proved to be suitable for the quantitative oxidation of the organic bleaching residues.

The oxidation by means of potassium iodate in presence of sulphuric acid may be shown by the following equation:

$$3[Cn(H_2O)m] + 2KIO_3 = 3[nCO_2] + 2KI + mH_2O$$

The potassium iodate is used in known but excessive amounts. After completion of the reaction which proceeds at elevated temperature, the excess of iodate is determined by means of potassium iodide which frees iodine.

$$KIO_3 + 5KI + 3H_2SO_4 = 3I_2 + 3K_2SO_4 + 3H_2O$$

The liberated iodine is titrated with sodium thiosulphate as usual.

The thiosulphate equivalent to the initial amount of potassium iodate minus the thiosulphate required in the titration of the treated sample gives a difference which is the amount of iodate required for the oxidation of the organic substances. This amount of potassium iodate used, is expressed in terms of oxygen which corresponds to the organic substances present in the residual liquor.

It is apparent that this method is not only suitable for the control of washed pulp but also permits the determination of the organic matter rendered soluble at any time of the bleaching and chlorination operation.

Experimental Part

Reagents and Equipment Required

N/10 sodium thiosulphate solution.
N/5 potassium iodate solution (approximately).
Potassium iodide, (crystals).
Sulfuric acid (1:1).
Starch solution.
Pyrex test tubes, (capacity approximately 80 cc).

Standardizing of N/5 Potassium Iodate

Pipette 2 cc. of iodate solution into a flask, add 20 cc. of water, 2 cc. of sulphuric acid and a few crystals of potassium iodide. The liberated iodine is titrated with N/10 sodium thiosulfate as usual.

$$\text{One cc N/10 } Na_2S_2O_3 = 0.003567 \text{ grs. } KIO_3$$

Preparation of Sample

In preparing the sample for analysis, take the pulp on which the degree of washing or the amount of the organic residues is to be determined and squeeze it

gently to obtain the residual water. After filtering, the liquid sample is ready for analysis.

Analytical Procedure

After running numerous determinations, the following procedure has been found to be the most convenient.

Pipette 5 cc. of the liquid to be analyzed into a pyrex test tube, add 2 cc. of sulphuric acid, 2 cc. of potassium iodate and mix contents thoroughly. Potassium iodate always must be added in excess. Place test tube in a boiling water bath and evaporate water in test tube. In order to prevent bumping, place a grid of wire supported just above on the bottom of the beaker. After the evaporation, place test tube in bath of phosphoric acid which was previously heated to about 170 deg. C. Keep sample in bath for 15 to 20 minutes at this temperature. After cooling the sample, add approximately 10 to 15 cc. of water, place test tube again, after thorough mixing, in a boiling water bath. The mixture is boiled until all of the liberated iodine has been expelled. To the cooled solution, a few crystals of potassium iodide are added and the liberated iodine, corresponding to the excess of iodate in the solution, is titrated with standard thiosulfate. Cc. N/10 $Na_2S_2O_3$ (a) used for standardizing 2 cc. of potassium iodate solution minus cc N/10 $Na_2S_2O_3$ (b) required in the back titration represents a difference which is due to the amount of potassium iodate required for the oxidation of the organic residues.

One cc N/10 $Na_2S_2O_3$ = 0.003567 grs. KIO_3 or 0.0008 grs. oxygen
(a-b) × 0.0008 × 20 × 1000 = oxygen number.

The total time required for running one determination amounts to about 3 hours. However, several determinations can be run conveniently at the same time.

Experimental Investigation of Method

The use of potassium iodate as an oxidation agent is well known and frequently used in analytical chemistry. The literature, however, is extremely sketchy as to the stability of potassium iodate at elevated temperature in presence of free sulphuric acid. It was, therefore, of importance to throw some light on this subject. For the purpose of this study, potassium iodate solutions of known concentration were heated to various temperatures in presence of free sulphuric acid and, after cooling, were retested for their iodate content. From the iodate contents of these heated and unheated samples, the stability of the iodate solution at various temperatures was experimentally demonstrated.

For this investigation "Kahlbaum" chemicals "pro analysis" were used. A 5-cc, burette graduated in 2/100-cc. divisions, allowing readings of 1/100 cc. was employed. The iodate solutions under investigation were kept for 20 minutes at the desired temperature with a tolerance of 3 deg. C.

For the study a standard iodate solution was prepared containing 0.8345 g. potassium iodate in 100 cc. of water. Two cc. of this solution require theoretically 4.68 cc. of 0.1 N sodium thiosulphate according to its iodate content. Practically, only 4.65 cc. of 0.1 $Na_2S_2O_3$ were used as the average value of four determinations. The procedure used in this study was as follows: 2 cc. of the standard iodate solution were accurately measured from a "Normax" pipette into a large test tube. After the addition of 2 cc. of sulphuric acid, (1:1) the sample was placed in a water bath and left in it until the evaporation of the water was completed. The sample then was ready to be heated for 25 minutes at the temperature under investigation, employing for this purpose a phosphoric acid bath previously heated approximately to the desired temperature. The sample, after heating was cooled down and then diluted with 15 cc. of water. In case of no discoloration of the liquid, the iodate was determined by means of potassium iodide and 0.1 N sodium thiosulphate in the usual manner. However, in case of the appearance of a brown-reddish discoloration, which is due to the liberation of iodine, the sample must be placed again in the water bath and heated until the iodine has been completely expelled. After that, the iodate is determined in the manner as previously described.

The results of several iodate determinations obtained after exposing the samples to various temperatures are shown in Table I. The figures reported represent the number of cc. of 0.1 N sodium thiosulphate required for 2 cc. samples of the iodate solution. It will be remembered that 2 cc. of the standard iodate solution require 4.65 cc. of 0.1 N $Na_2S_2O_3$.

TABLE I.—STABILITY OF POTASSIUM IODATE SOLUTION AT ELEVATED TEMPERATURES

20	100	150	180	185	190	200 Deg. C.
4.65	4.66	4.70	4.70	4.60	4.60	4.53
	4.64	4.64	4.64	4.62	4.58	4.53
	4.65		4.65			

From the data presented in Table I, it will be seen that potassium iodate solutions can be heated in presence of concentrated sulphuric acid up to 180 deg. C. without being decomposed. This is clearly shown by the uniform amounts of 0.1 N thiosulfate used up to this temperature. At 185 deg. C. a slight decomposition seems to occur which is analytically shown by the somewhat smaller amount of 0.1 N thiosulfate required. Between 180 and 185 deg. C. the decomposition of iodate seems to start. It is noteworthy that the results obtained are confirmed by analytical data of satisfactory reproducibility. Concluding this section of the study, we may safely assume that potassium iodate can be heated in presence of concentrated sulphuric acid up to 180 deg. C. without being decomposed.

Temperature for Complete Oxidation

The next question to be investigated was the determination of the temperature at which the oxidation of the organic substances is complete and furthermore whether reproducible results can be obtained. The completeness of the oxidation was analytically demonstrated by the demand of constant amounts of potassium iodate in spite of changing the method of procedure.

The test solution under investigation was obtained by squeezing samples of bleached sulphite pulp being incompletely washed. This liquid, containing residual organic matter in sufficient amounts, was filtered and served as the standard sample for the following investigation.

The procedure employed was as follows:

Two cc. of the residual water, 2 cc. of the potassium iodate solution (of the same strength as described in the foregoing paragraph) and 2 cc. of sulphuric acid (1:1) were pipetted into a large test tube which was placed in a water bath. The sample was allowed to remain in the bath until the water in the test tube was completely evaporated. The sample now was ready for further heat treatment which consisted in placing the test tube in a bath of phosphoric acid previously heated to the temperature

under investigation. The test tube was kept in the bath for 25 minutes, then the excess of potassium iodate was determined in exactly the same manner as described in the foregoing paragraph.

The results of several determinations are given in Table II.

TABLE II.—TEMPERATURE REQUIRED FOR THE COMPLETE OXIDATION

100	130	140	150	160	170	180 deg. C.
4.14	3.80	...	3.54	3.52	3.52	3.52
4.14	...	...	3.44	3.52	...	3.52

The figures in Table II represent cc. of 0.1 N sodium thiosulphate corresponding to the KIO_3 content of the mixture.

Two cc. of the prepared standard potassium iodate solution requires 4.65 cc. of 0.1 N thiosulfate solution as previously stated. In comparing this figure with those compiled in Table II, we find that some oxidation must have taken place at 100 deg. C. This is indicated by the smaller amount of thiosulphate required to determine the iodate contained in the sample after heating. The difference obtained by subtracting 4.14 from 4.65 represents the equivalent amount of iodate required for the oxidation of the organic matter at 100 deg. C. At 130 deg. C. the amount of iodate was found to be still smaller indicating a more complete oxidation. Consideration of this table shows that the oxidation reaches a maximum at 160 deg. C., and remains constant in spite of increasing the temperature. This is shown by the constant amounts of iodate found corresponding to the equal amounts of thiosulfate used.

In other words, 160 deg. C. represents the minimum temperature at which complete oxidation of the organic substances occurs. Temperatures higher than 160 deg. C., but not exceeding 180 deg. C. (see foregoing paragraph) do not cause any further change in the iodate content of the solution as clearly shown in Table II.

The results as compiled in Tables I and II, indicate the soundness of the method which is based on two facts:

First, potassium iodate is not decomposed in presence of concentrated sulphuric acid at temperatures up to 180 deg. C.

Second, organic substances are completely oxidized by means of potassium iodate and sulphuric acid at temperatures above 160 deg. C. The completeness of the oxidation is established by the reproducibility of the results.

Since this work was started, the author's attention has been called to R. J. Williams' publication, "Organic Oxidation Equivalent Analysis" in which the use of potassium iodate for the micro-analytical determination of organic substances is discussed. This article has been of considerable value in the investigation of the above method.

Application of Method to Mill Practice

The washing of bleached pulp may be defined as the removal of the bleaching residues from the pulp. The amount of the residues still retained by the pulp after washing, therefore, is a criterion of the degree of washing. In the foregoing sections of this paper it was shown that the organic residues are determined by their oxygen demand. Introducing the term "oxygen number" we have a means of expressing the degree of washing numerically. By setting up standards for the oxygen number, we are able to classify the degree of washing, from which valuable information may be drawn in regard to the washer operation itself, to the color reversion of pulp and to the effect of proper soaking.

In setting up such standards for control, there is no single rule applicable to all bleach plants. Each plant should establish its own standards since they greatly depend on local conditions and special pulp requirements. There are, however, certain basic points, which within certain limits, might help to establish the proper standards. Generally speaking, pulp being sufficiently well washed may be characterized by an oxygen number not exceeding 6.0. Figures above that standard undoubtedly point to less complete washing which might be due either to poor operation of the washer itself or to the lack of sufficient soaking of the pulp previous to the washing. The application of the oxygen number is not restricted to an inspection of the efficiency of the washer operation alone. An important application lies in the field of inspecting of opportunity for proper diffusion or soaking before the washer is reached. Pulp might leave the washer sufficiently washed as regards that particular piece of equipment, as would be indicated by a low oxygen number, and still the pulp might show a high tendency to revert in color subsequently in storage and would be accompanied by a considerable increase in the oxygen number, because color reversion has been found to be in a close relationship to the oxygen number which increases in direct proportion. One could then be led to suspect that the pulp had not been sufficiently diffused by soaking under proper conditions previous to washing. This permitted only an incomplete diffusion of the impurities from the fibrous material. It is obvious that such pulp when subjected to washing is only incompletely freed from the bleaching impurities in spite of an apparent good washing efficiency. We might say, the pulp is washed only on the surface. Such pulp when kept in storage at a low consistency is placed in a state that permits a subsequent diffusion of the organic residues from the internal surface of the fibrils to the external layers of the fibrous material which results in the reversion in color of the pulp and in an increase of its oxygen number.

The results of several oxygen number determinations will be discussed in connection with distinctive physical properties of the pulp. This is done in an effort to show the field of application and usefulness of the method.

In order to give further proof of the reproducibility of results of the proposed method, analyses were run for each sample in triplicate.

Several samples of bleached sulphite were taken from the bleach cells previous to their dumping. The pulp samples were hand washed in the laboratory in the manner approximating practical washer operation and afterwards analyzed for their color and ash contents.

TABLE III.—BLEACHED SULPHITE, PROPERTIES AND OXYGEN NUMBERS OF RESIDUAL WATER

Sample	1	2	3	4	5	6	7	8
Color of pulp: per cent brilliance	....	....	....	86	86	88	88	89
Color of pulp: per cent Yellow	....	....	....	15	13	13	12	10
Ash of pulp, per cent	.22	.26	.28	.18	.24	.23	.22	.27
Color of residual water	110	80	65	85	55	55	50	35
Oxygen No. of residual water; run in triplicate	13.58	7.98	6.38	10.8	9.6	7.16	6.24	4.8
	13.48	7.78	6.38	11.6	9.6	7.16	6.38	4.4
	13.0	7.98	6.72	11.2	9.6	7.48	6.06	4.4
Average	13.41	7.91	6.49	11.2	9.6	7.26	6.22	4.53

Simultaneously, determinations of the oxygen number were carried out with the residual water squeezed from the corresponding samples.

Results of the physical and chemical determinations are compiled in Table III.

From the data presented in Table III several pertinent facts are evident:

(1). The method of determining the oxygen number gives reproducible results. The results are satisfactory and show a relatively small variation which is well within the experimental error. The method, in its proposed procedure, is accurate and reliable enough to be used in routine work.

(2). The color of bleached pulps[2] and their corresponding oxygen numbers are in a close agreement with each other.

Well washed pulps show low oxygen numbers, while poorly washed pulps have much higher values. This is easily understood since in well washed pulps the organic bleaching residues are removed to a very high extent. The minute amounts of organic residuals still retained will result in only a low oxygen number.

(3). The color of the residual water[3] contained in the washed pulp also is in close agrement with the color of the pulp as well as the oxygen number as shown by the data obtained.

(4). The ash content of the pulp, however, has been found to be in poor relationship with the color of the pulp and with the corresponding oxygen number. In Table III cases of low color and low ash contents as well as such high color and high ash are simultaneously registered. This shows very distinctly the lack of correlation between the ash and the color of the pulp. Similar irregular conditions exist between the ash of pulp and the oxygen number. We find in Table III high ash contents together with low oxygen numbers and vice versa. In other words high ash contents are found in well washed pulps as well as in those that are poorly washed. This shows very clearly that the ash of bleached and washed pulp cannot be taken as the criterion from which the degree of washing may be judged. This is furthermore emphasized by considering the ash contents compiled in Table III. The low ash content of sample 4, for instance, points to a pulp being well washed. The corresponding oxygen number, however, indicates a pulp of a relatively low degree of washing. The question arises now which of the two tests is the correct one and correctly reflects the actual working conditions.

The answer to this question is found in Table III. Here we find that the color of the pulp is relatively low which corresponds nicely to the relatively high oxygen number. Furthermore, we find that the color of the residual water is also relatively low which, being again in good agreement to the oxygen number, points to a poorly washed pulp. In making similar comparisons with the results of the other samples compiled in Table III, we come to the definite conclusion that the oxygen number is one means which gives useful and competent information concerning the washing of pulp. On the other hand we are justified in saying that the ash content of the washed pulp does not represent a reliable indication as to the degree of washing. This is explained by the different physical behaviour of electrolytes and non-electrolytes as previously discussed.

We have seen that pulps with low oxygen numbers are well washed and the tendency to revert in color with time in storage is therefore, rather limited.

In the following study we show the relationship between the oxygen number and the degree of reversion in color. Although this investigation is as yet far from complete it may be worthwhile in showing to what extent the results so far obtained may clarify the question of color reversion.

In carrying out this study, many samples of hand washed bleached sulphite of known characteristics were allowed to stand for 24 hours at a consistency of approximately 5 per cent. The samples were stored in places protected from light and dust. The color and the oxygen number of the original samples and those of the stored pulps were very carefully determined.

By comparing the results of the corresponding tests with each other we learn how much color reversion we can expect from a given initial oxygen number. Summarization of results of these tests is given in Table IV in the order of decreasing value of the initial oxygen numbers.

TABLE IV

Sample No.	1		2		3		4	
	Initial Sample	After 24-hr.	Inital Sample	After 24-hr.	Initial Sample	After 24-hr.	Initial Sample	After 24-hr.
Color—per cent brilliance ..	90	88	91	90.5	92	91	90	90
Color—per cent yellow	10	13	7	9	7	9	10	10
Oxygen No...	4.7	10.7	2.4	3.7	2.2	5.6	2.0	4.1
Color reversion (points) per cent brilliance	...	2	...	0.5	...	1	...	0
Per cent yellow	...	3	...	2	...	2	...	0

The really serious drop in color is the one of 3 points in yellow and 2 in brilliance in sample No. 1. This drop is accompanied by a considerable increase of the oxygen number as is to be expected. Significant also in this respect are the results of sample No. 4. Here we find that a pulp showing an initial oxygen number of 2, did not revert in color after a storage period of 24-hours although a marked increase of the oxygen number has been found.

From the results obtained it appears that bleached sulphite having an oxygen number of approximately 5 reverts considerably in color after being stored in slush state for even so short a time as 24 hours, while pulp with an oxygen number of 2 maintains safely its initial color. The oxygen number represents therefore a useful means of predicting the degree of color reversion to be expected in storage.

In application of the method as an aid in control of pulp washing, the author cautions that standards applicable to the operation of any particular bleach plant, and representative for various grades of bleach pulps should be worked out to fit the requirements of conditions at each individual mill.

Literature Cited

(1) R. J. Williams, *J. Am. Chem. Soc.* 59, 288 (1937)
(2) R. J. Williams, *J. Am. Chem. Soc.* 59, 291 (1937)

[2] The color was measured by means of the Blanchard colorimeter. The color of the pulp is determined by measuring the intensity of reflected white and blue light. Results are expressed in per cent brilliance which corresponds to the action of white light and in per cent yellow corresponding to the effect of blue light.

[3] The color of the residual water was colorimetrically determined using platinum-cobalt solutions as standards.

Steam Generation for Paper Mills*

By M. H. Kuhner[1]

Abstract

Comments on the improvement of present steam plant installations and the factors affecting power plant equipment selection.

Few industries are more dependent on steam for their products than the pulp and paper industry; and in few industrial plants is the cost of the finished product as closely related to the cost of steam production.

In many industrial plants the boiler house is considered a necessary evil and is therefore neglected when expenditures for plant maintenance and purchase of new equipment are considered. In the paper mill, however, the steam plant is truly the heart of the mill, and its efficiency, and particularly its reliability, are of constant concern to the management.

In many pulp and paper mills the opportunities for lowering production cost by reducing the annual fuel bill and by efficient utilization of the steam produced go unrecognized. Yet in few industries are there greater opportunities for such savings.

Pulp and paper mills consume large quantities of steam and power. They are in an ideal position to produce power substantially as a by-product of the steam which is otherwise required for the manufacture of the principal product.

Paper mills constructed during the past decade have availed themselves of the opportunity of supplying all or part of their power requirements by the installation of high pressure boilers and turbine generators for producing by-product power. There are, however, a large number of older mills in operation which either purchase their power or produce it with low pressure steam at a relatively high cost. These mills, because their paper production cost is high, have difficulty in competing with modern mills producing their own power.

Creates Favorable Competitive Position

A study of possible improvements in existing mills by the installation of new steam generating equipment, turbines and generators, or simply by modernizing the equipment already installed to make it more efficient, generally reveals that a comparatively small investment will so reduce the fuel bill as to place the mill in a favorable competitive position. It is, of course, necessary that before starting the actual work of reconstruction or before purchasing new equipment, a thorough study be made of the distribution of steam in the mill and the requirements for electrical power. The balance between the amounts of steam required for digesters, paper machines, evaporators, etc., and the power necessary to drive the mill machinery will determine the pressure and temperature at which steam is to be generated. Paper machine driers, evaporators, and digesters use steam in the pressure range from 5 to 150 pounds. By generating the steam at higher pressure and passing it first through turbines extracting or exhausting at proper pressures, all or most of the power required to drive the equipment of the mill can be produced. The cost of power so obtained is extraordinarily low. Its fuel cost is represented merely by the difference in the amount of heat entering and leaving the turbine.

TABLE I.—POWER PRODUCED PER 100 POUNDS STEAM AT VARIOUS PRESSURES AND TEMPERATURES EXHAUSTING AT 150 POUNDS GAGE—400 DEG. F.

Steam Pressure Lbs.—Gage	Steam Temp. Deg. F.	Kw.-hr. Per 1,000 Pounds Steam	
		Theoretical	With 70 per cent Turbine Eff.
1,000	740	54.2	39.9
900	720	51.3	35.9
800	700	47.4	33.2
700	660	43.1	30.1
600	640	38.6	27.0
500	605	32.8	23.0
400	570	26.9	18.8

Table I shows the power which it is possible to produce in kw-hr. per thousand pounds of steam flowing thorough a non-condensing turbine exhausting at 150 pounds pressure and 400 degrees. The pressures and temperatures required at the turbine throttle are shown. For example, if 1,000 pounds of steam at 600 pounds pressure, 640 deg. F. is passed through a turbine exhausting at 150 pounds pressure, the energy produced will be approximately 27 kw-hr. Assuming that the steam is generated with 80 per cent boiler efficiency with coal at $5.00 per ton, one kw-hr. can be produced for less than $0.001.

The majority of modern mills generate steam at pressures between 500 and 650 pounds and at temperatures between 600 and 750 deg. F. The table shows that the higher the initial steam pressure and temperature the greater the power available. Obviously higher pressures require larger investments.

Duty of Paper Mill Engineer

While it is the duty of paper mill engineers to keep the management advised of possible savings to be obtained by plant improvements, they cannot be expected to make the necessary detailed studies which will result in the selection of the proper steam plant equipment to best serve the present and future needs of the plant. Their services are needed in keeping the plant in operation and in maintaining the mill machinery. The services of competent consulting engineers should be engaged to assist the mill men in planning for the future.

It is not within the scope of this paper to discuss electrical power generation, but I shall use the allotted time to point out a few of the important design requirements for steam generating equipment suitable for paper and pulp mills and later shall describe with illustrations a number of the modern steam generating units recently installed by my company in paper mills and some that are now under construction.

Factors Affecting Equipment Selection

Boilers in paper mills must be designed for the existing or expected operating conditions. It is often assumed that the type and design of boiler in success-

* Presented at the Fall Meeting of the Technical Association of the Pulp and Paper Industry.

[1] Chief Mechanical Engineer, Riley Stoker Corp., Worcester, Mass.

ful central station service, or serving some other industrial plant, can be duplicated for a given paper mill. This, however, is not so.

In the selection of steam generating equipment for pulp and paper mills the following basic requirements must be recognized.

1. The boiler must be able to quickly respond to sudden and extreme load changes, which usually occur without warning.

To cite an example: digestor operators have a habit of scheduling their cooks without reference to the convenience of the boiler plant engineer. It is not unusual for them to open wide a 12-inch steam valve or its equivalent, or to close it rapidly.

On the other hand, a break in the paper machine will suddenly reduce the steam demand. If boiler and firing equipment are not designed for this contingency, the steam pressure will rise, safety valves will blow, water will disappear from the glass, and the equilibrium of the boiler room routine will be generally upset. While co-operation between the power plant and process departments will produce better operating conditions with any type of equipment, modern boiler must be designed to cope with these contingencies.

2. Another consideration is the relatively small amount of condensate returned to the boiler house, necessitating the use of large amounts of make-up water in the boiler feed.

The boilers must be able to handle a relatively high concentration in the boiler water and must be designed so that suspended solids in the boiler water will be kept in motion to prevent their settling out in tubes, drums and headers exposed to high temperatures. Otherwise dangerous ruptures may result.

3. Of equal importance is the cleanliness of steam, especially when used at high pressure and high temperature in steam turbines. Dirty steam will result in short life of turbine blading, impair the efficiency of power production, and reduce the capacity of turbine-generators. To produce steam of a high degree of purity, leading boiler manufacturers have developed efficient steam purifying equipment.

4. The close relationship between cost of steam and cost of finished paper product necessitates high boiler efficiencies. The use of heat recovery equipment, such as economizers or airheaters or both is usually justified.

5. Finally and above all, boilers in paper mills must be reliable. A forced shut-down of the mill caused by interruption of steam supply is a costly matter. Large quantities of materials in process may be spoiled, production schedules disrupted, and mill earnings quickly converted into losses.

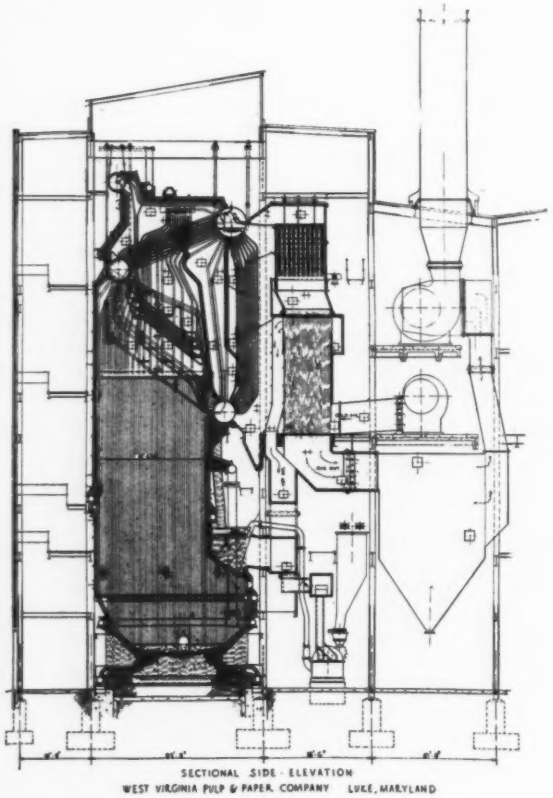


FIG. 1.

Trend in Steam Plants

The trend in modern industrial plants is definitely toward the use of a small number of highly efficient boilers of large capacity. To avoid investment in non-productive units, stand-by boilers are frequently omitted. Dependability of boilers is therefore now of much greater importance than in the past. In times past when large numbers of boilers were installed in batteries, no serious trouble developed if one of these small units broke down.

TABLE II.—TYPICAL INSTALLATIONS OF STEAM GENERATING UNITS IN PAPER MILLS BETWEEN 1921 AND 1938 SHOWING TREND IN UNIT CAPACITY, PRESSURE AND TYPE OF FIRING

Year Inst.	Plant No.	No. of Units	Unit Cap., Lbs. Steam per Hour	O.P. Lbs. per Sq. In.	Total Steam Temp., deg. F.	Method of Firing	Fuel	Efficiency
1921	1	1	50,000	225	547	Stoker	Coal	73
1922	2	3	36,000	205	410	Stoker	Anthracite	72
	3	2	45,000	200	440	Stoker	Coal	73
1923	4	3	70,000	200	538	Stoker	Coal	73
	5	4	75,000	200	465	.....	Natural Gas	...
1924	6	2	65,000	150	385	Stoker	L.V. Coal	82
1925	2	3	43,500	205	500	Stoker	Anthracite	73.5
	7	2	39,000	250	525	Pulv. Coal	L.V. Coal	82
1926	8	1	80,000	350	560	Pulv. Coal	M.V. Coal	90
1927	7	3	70,000	250	525	Pulv. Coal	L.V. Coal	82
1928	9	1	62,800	250	445	Stoker	L.V. Coal	...
1929	5	4	50,000	200	485	Gas Burners	Natural Gas	...
1931	10	2	50,000	140	381	Stoker	Anthracite	73.5
1933	11	1	21,000	300	Sat.	.....	Oil	...
1934	12	1	150,000	235	650	Pulv. Coal	H.V. Coal	83.5
	13-A	1	375,000	520	750	Pulv. Coal	L.V. Coal	80
	14-A	1	375,000	600	700	Pulv. Coal	L.V. Coal	80.5
	15	1	200,000	500	625	Pulv. Coal	L.V. Coal	83.5
1935	16	1	60,000	400	650	Pulv. Coal	H.V. Coal	85.0
	17	1	66,000	250	505	Pulv. Coal	M.V. Coal	84.0
1936	18	1	125,000	415	650	Pulv. Coal	H.V. Coal	85.0
	19-A	2	71,600	580	700	Pulv. Coal	M.V. Coal	85.2
	20-A	2	225,000	570	715	Pulv. Coal	L.V. Coal	84.5
1937	14-A	1	375,000	580	720	Pulv. Coal	L.V. Coal	84.0
	21	1	55,000	325	600	Pulv. Coal	H.V. Coal	78.5
	22	1	80,000	610	710	Pulv. Coal	H.V. Coal	86.0
1938	13-A	1	375,000	560	720	Pulv. Coal	L.V. Coal	85.5
	23	2	75,000	650	700	Pulv. Coal	H.V. Coal	84.2

Cross Section of Years 1921-1938

Table II is a list of boiler installations picked at random and representing a cross-section of steam generating units installed in paper mills between the

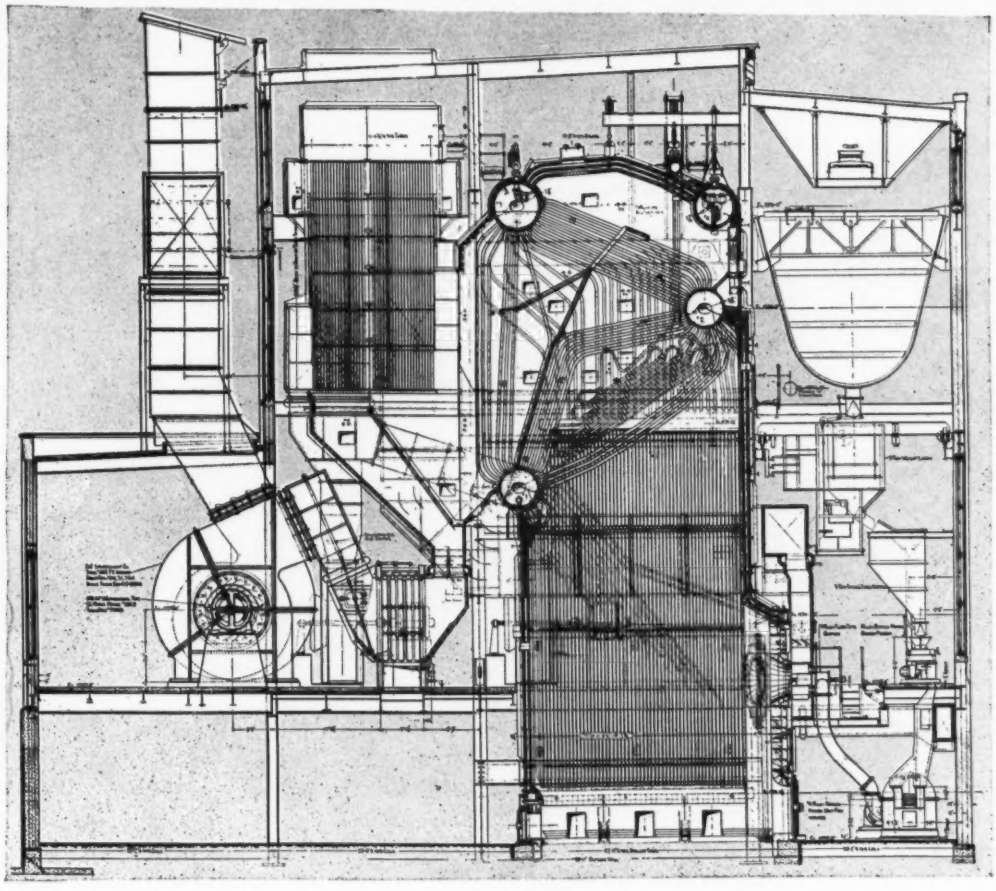


FIG. 2.

years 1921 and 1938. It shows a decided trend toward larger units, higher pressures and steam temperatures and a very pronounced swing from stokers to pulverized coal. The preference for pulverized coal firing in paper mills is explained by the greater sensitivity of this method of firing to sudden steam load changes. Furthermore, it is generally admitted that a larger variety of types and grades of coal can be burned satisfactorily in pulverized form than on stokers.

In mills operating twenty-four hours per day and seven days a week, pulverized coal firing has the further advantage that all equipment requiring maintenance is located outside of the furnace in an accessible place, while with stokers the boilers must be shut down and cooled before any work can be done.

In the boiler house of the Williamsburg, Pa. mill of the West Virginia Pulp and Paper Company, There were ten old straight tube boilers fired by stokers operating at an efficiency somewhat below 70 per cent. These boilers were replaced by two modern steam generating units. Not only was the steam generating capacity of the boiler house increased by over 50 per cent and its overall efficiency raised to above 85 per cent, but part of the space previously occupied by the old boilers was made available for auxiliary equipment.

Representative Installations

The following illustrations show a few installations which are successfully fulfilling the requirements placed on steam generating equipment in paper mills.

Fig. 1 shows a steam generating unit operating at 650 pounds pressure, 700 deg. F. steam temperature, delivering 375,000 pounds of steam per hour at approximately 85 per cent overall efficiency. It is one of two units installed in the Luke, Md. mill of the West Virginia Pulp and Paper Company. The fuel is eastern bituminous coal. This installation is interesting because it has been designed to burn a variety of inexpensive coals coming from the mines in the neighborhood of the mill. The coal purchased is of low grade, high in ash, and generally of the type that coal mines cannot sell to consumers at any great distance from the mines.

Represents a Distinct Advantage

The ability to burn this low cost coal represents a distinct advantage to the Luke mill. This mill consumes between 150,000 and 200,000 tons of coal per year. The type of coal furnished by the various mines to the Luke mill varies over a wide range. The ash fusion temperature may run as low as 2,000 deg. F. or as high as 2800 deg. F. The ash content will run from 5 to 20 per cent. With this fuel available, only one method of firing could be considered, namely, pulverized coal, and because of the nature and amount of the ash it was decided to design the furnace so that the ash could be tapped off in molten form.

I wish to call attention to the design of boiler and

water walls. Particular thought has been given to unrestricted circulation. In the lower part of the furnace temperatures as high as 3200 deg. F. have been observed. It is apparent that the bare water wall tubes exposed to such high temperatures must be kept cool by rapid natural circulation of water.

Steam forms in the water walls and in those boiler tubes which are exposed to the radiant heat of the furnace at the rate of 20 to 30 pounds per lineal foot of tube per hour which means that up to 80 per cent of the total steam is generated in the water wall system and in the first few rows of boiler tubes.

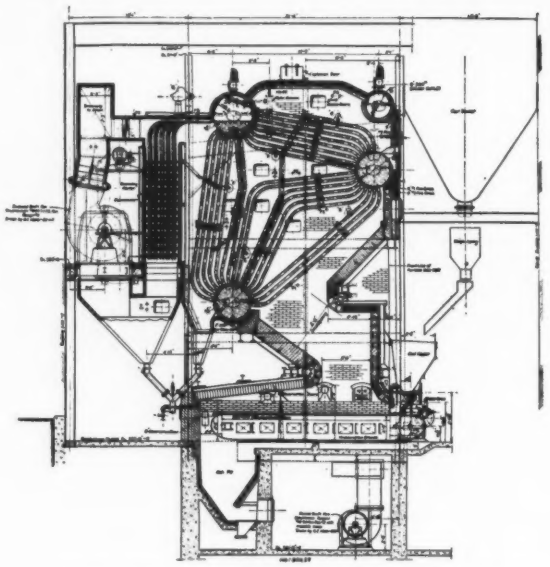
It is important that this large volume of steam is liberated without having to find its way through a solid mass of water. Therefore all tubes carrying large amounts of steam enter the steam liberating drum above the water line. The steam, before leaving the drum, is washed by the clean incoming feed water and then dried in a separator. With this system of steam purification less than 2 p.p.m. of solids remain in the steam. This means protection for the superheater and a long efficient life for the turbines.

Eight Similar Units Installed

It may be of interest to point out that in the various plants of the West Virginia Pulp and Paper Co. alone, a total of eight similar units have been placed in service during the past four years with a combined generating capacity of approximately 2,200,000 pounds of steam per hour. Of all of these units being fired by pulverized coal, only two are equipped with slag tap furnaces. The ashes are removed in dry form from the furnaces of the remaining six units. All of these units, installed during the past four years generate steam at approximately 600 pounds pressure and 700 to 750 deg. F. Full advantage has been taken in these plants of the by-product power generated by the high pressure steam.

In 1936 in the Williamsburg, Pa. mill of the same company, two smaller steam generating units were put into service. Each of these units has a capacity of 73,000 pounds per hour at 580 pounds pressure, 700 deg. F. steam temperature.

Fig. 2 shows two steam generating units, 375,000 pounds per hour capacity, 560 pounds pressure, 720 deg. F. steam temperature, pulverized coal fired, installed in the Covington, Va. mill of the West Virginia Pulp and Paper Company.



TWO RILEY STEAM GENERATING UNITS
FOR
IMPERIAL PAPER & COLOR CORP.
GLENS FALLS, N.Y.

FIG. 3.

A steam generating unit, 200,000 pounds per hour capacity, 530 pounds pressure, 630 deg. F. temperature, pulverized coal fired was installed in the Manayunk, Pa. plant of the Container Corporation of America.

High Efficiency Through Economizers

Fig. 3 shows two steam generating units, each of 50,000 pounds per hour capacity, 300 pounds pressure, saturated steam, burning No. 3 anthracite buckwheat coal on Harrington travelling grate stokers, installed in the Glens Falls, N. Y., plant of the Imperial Paper and Color Corporation. High efficiency is attained in these units through the use of economizers.

A steam generating unit, 150,000 pounds per hour capacity, 275 pounds pressure, 650 deg. F. pulverized coal fired was installed at the Kalamazoo Vegetable Parchment Company in Kalamazoo, Mich.

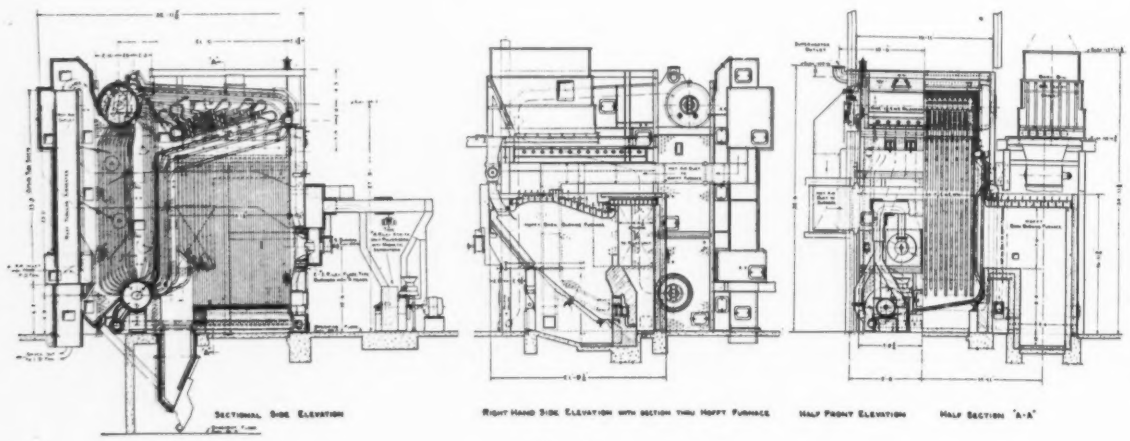


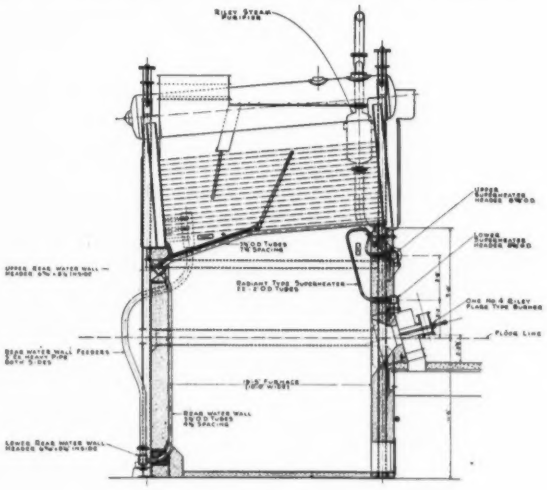
FIG. 4.

A steam generating unit was recently placed in service at the Port Huron Sulphite and Paper Company's mill in Port Huron, Michigan. The capacity of this unit is 80,000 pounds per hour at 675 pounds pressure and 710 deg. F., pulverized coal fired.

Fig. 4 shows two steam generating units, 75,000 pounds per hour each, 650 pounds superheater outlet pressure, 700 deg. F. pressure, pulverized coal fired now being installed at the Green Bay. Wis. plant of the Northern Paper Mills, Inc. This shows an interesting installation of steam generating units of which one is equipped with a Hofft furnace for burning of bark. This steam power plant will be one of the most modern and efficient in the paper industry.

Rebuilt Old Boilers Become Efficient Steam Generating Equipment

While all of the foregoing illustrations show new steam generating units, it must not be assumed that it is necessary to install new equipment to realize the

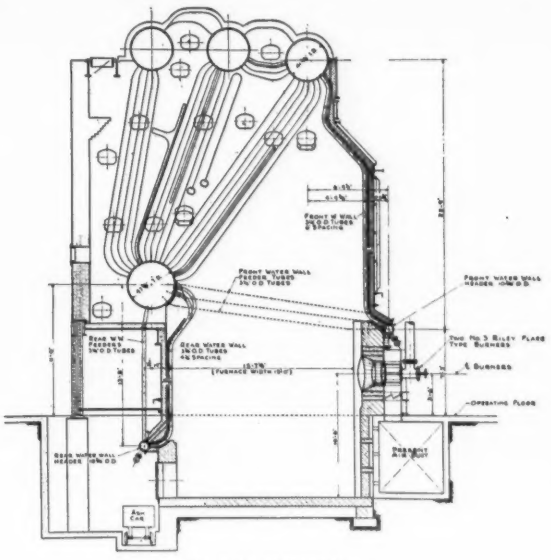


SECTIONAL SIDE ELEVATION

FIG. 5.

benefits of a modernized steam generating plant.

Very often the boilers in the plant, while old, may be in perfect working order, and all that is necessary to improve the steam generating efficiency of the plant



SECTIONAL SIDE ELEVATION

FIG. 6.

is a change in firing equipment, or simply improved furnace shape and furnace construction. The following illustrations show a few boiler installations in which capacities and efficiencies were greatly improved by reconstruction of the furnace and by changing from obsolete, inefficient, firing methods to pulverized coal or modern stokers. The old boilers were not disturbed but water walls were added to the reconstructed furnaces and in every case improved operating conditions, higher capacities and combustion efficiencies and reduction of furnace maintenance costs resulted in such savings that the investment required for these modernizations was returned in less than a year.

An Inexpensive Improvement

Two steam generating units, 55,000 pounds capacity each, 175 pounds pressure, 500 deg. F. temperature, are installed in the Manayunk, Pa. plant of the Container Corporation of America. Originally the boilers were fired by old type inefficient stokers. At comparatively small expense the furnaces were enlarged,

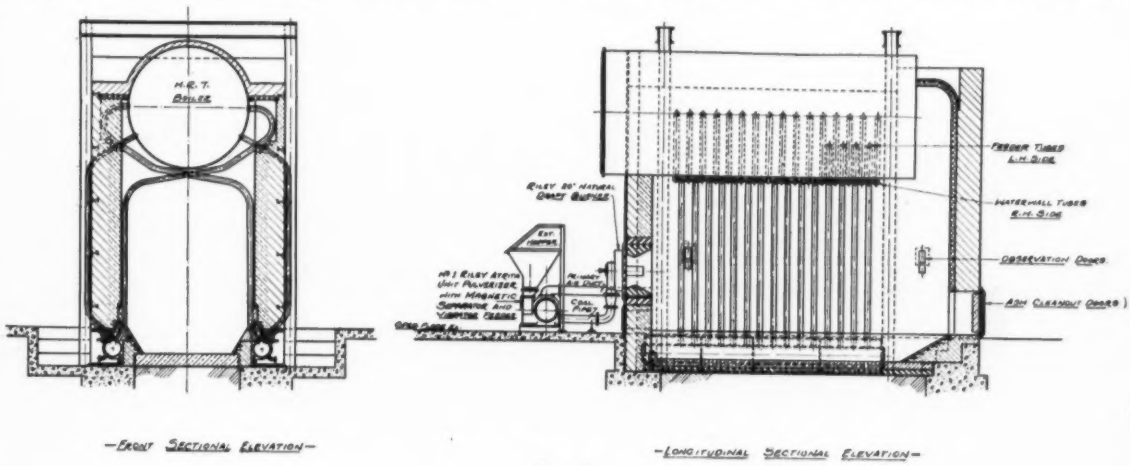


FIG. 7.

TABLE III.—TABLE SHOWING SAVINGS IN FUEL AND POWER COSTS ACCOMPLISHED WITH MODERN STEAM POWER PLANTS IN PAPER MILLS

Plant	Capacity of Mill in Tons of Paper per 24 hr. Day		Kind of Paper Manufactured	Is Pulp Produced in Mill	Is Power Purchased		Is Power Generated as by-Product		Steam Pressure on Boilers		Steam Temperature or Superheat		Method of Firing		Cost of Coal per Pound of Paper		Cost of Power per Pound of Paper		Lbs. of Coal per Pound of Paper		K.W.H. per Pound of Paper		Year Steam Plant Was Modernized	Per cent Saving in Cost of Fuel and Power With Modernized Plant over Old Plant
	Old Plant	New Plant			Old Plant	New Plant	Old Plant	New Plant	Old Plant, Lbs.	New Plant, Lbs.	Old Plant	New Plant	Old Plant	New Plant	Old Plant	New Plant	Old Plant	New Plant	Old Plant	New Plant	Old Plant	New Plant		
A	150	150	Newsprint	Yes	Yes	Yes	No	No	125	145	None	10°	Chain Grate & Hand	Chain Grate Pulverized Fuel	$.00117	$.00095	.....	.....	.6335	.516	...	...	1932	23%
B	...	60	Board	Yes	.....	.....	.....	No	...	160	....	None	.....	Riley Stokers Pulverized Fuel	.....	.0011	.....	.....	...	.45	...	.024	1929	....
C	75	75	.....Rope,	Yes	Yes	No	No	Yes	150	600	None	650°	Murphy Stokers	.....	.0049	.0032	$.00037	0.00015	2.11	1.51	.389	.389	1938	54%
D	...	50	Jute & Wood	No	Yes	Yes	Yes	Yes	150	165	None	450°	Hand	.....	.....	.....	.....	.....	...	...	...	...	1928	25%
E	...	...	.....Book,	...	.....	.....	.....	.....	..	...	....	....	.....	.....	.....	.....	.....	.....	...	...	...	...	....	26%
F	125	100	Hanging and Coating Base	No	Partly	Partly	Partly	Partly	150	240	490°	530°	Stoker	Pulverized Fuel	.....	.....	.....	.....	1.143	.975	.240	.315	1930	14%
G	...	...	.....	...	.....	.....	.....	.....	...	...	....	....	.....	.....	.....	.....	.....	.....	...	...	...	...	....	20%
H	35	35	Tissue Paper	No	No	No	.....	.....	160	175	400°	450°	Stoker Hand & Stoker	Pulverized Fuel	.004	.0031	.....	.....	2.12	1.65	...	...	1935	29%
I	33	33	Paperboard Container	No	Partly	Partly	No	No	160	250	450°	600°	.....	Pulverized Fuel	.....	.....	.0046	.0043	1.19	.96	...	...	1936	24%
J	500	500	Board	No	Partly	No	Partly	Yes	180	500	70°	50°	Stoker	Pulverized Fuel	.....	.....	.....	.....	.602	.51	.122	.1465	1935	24%
K	50	150	Bond & Book	Yes	Partly	Partly	Partly	Partly	150	350	None	125°	Stoker	Pulverized Fuel	.....	.....	.....	.....	1.69	1.39	...	.435	1930	21%

water walls added and pulverized coal equipment installed, which increased the capacity of these boilers approximately 50 per cent and very materially improved their efficiency.

Fig. 5 shows another application of a new pulverized coal furnace, water-cooled rear wall and superheater to an old box header type straight tube boiler.

Fig. 6 shows an installation of new pulverized coal furnaces and water walls applied to old Stirling type boilers.

Fig. 7 shows a pulverized coal furnace and water walls applied to an HRT boiler.

The most important job of the management of any manufacturing concern is to keep costs down. Only by keeping the cost of the finished product so low that it can be sold at a reasonable profit and in competition with others can the manufacturer stay in business. An important item in the cost of paper is the cost of steam and power. Consequently there are opportunities for saving in the power plant. It is necessary to recognize these opportunities and take advantage of them. It is not unusual for paper and pulp mills to cut the annual fuel and power bill in half, simply by replacing antiquated steam generating and fuel burning equipment with modern, efficient units, and by generating the power required in the mill as a by-product of the process-steam.

Results in Progressive Paper Plants

Table III shows the results obtained in a number of progressive plants in the paper industry. It shows data acquired from the records of these plants. Costs of steam and power per pound of product produced are listed, and show in each instance that the cost of the finished product has been greatly reduced by modernizing the power plant. The various mills listed in the table produce a wide variety of paper products. Some of them purchase their pulp, others make their own, which accounts for the spread in the ratios of pounds of coal to pounds of paper, and of power to pounds of paper.

Any fuel saving in the individual plant is related to the larger national economics scheme. It is true that we speak of our unlimited natural resources, but each ton of coal and each barrel of oil taken from the ground is irretrievably lost to us and only the politicians believe that the pump will never run dry. We should bear in mind that unless we exercise greater economy in the consumption of our fuel resources, paper may become a very costly article. Millions of tons of fuel are unnecessarily wasted every year in inefficient boiler plants. We owe it to our country and to those who come after us to reduce this waste, and to produce steam and power economically with the most efficient equipment available.

Constantly Reducing Steam Cost of Paper

Modern steam generating units are reliable and efficient, but possibly minor alterations or additions in the existing power plant are all that is required to raise the efficiency and reliability of steam production. Progressive paper mills are constantly reducing the steam cost of paper. Taxes, labor and freight rates are not controllable; but the cost of steam and power in the paper mill, and thus the cost of the finished product can be reduced by proper attention to the power plant.

The Absorption of SO_2 in Water*

By Chas. E. Reiley [1]

Abstract

The absorption of SO_2 in water in a tower packed with wood-lattice grids has been studied with regard to the effect of gas velocity, liquor velocity, and temperature on the rate of gas absorption. Increasing gas velocity and liquor velocity produce an increase in rate of absorption, the former being of greater importance at the higher liquor rates and the latter being of most importance at low liquor velocities, while an increase in temperature decreases the rate of absorption. Overall absorption coefficient has been found to vary with the 1.43 power of liquor velocity, and with the 1.26, 2.11, 2.17, and 2.26 power of gas velocity at liquor velocities of 1.49, 1.99, 2.48, and 2.98 feet per minute, respectively. Information suitable for the design of absorption equipment is presented.

Theory

The theory of gas absorption has undergone much revision and clarification in the literature in the past several years, the two-film theory having been accepted universally as the logical explanation of the mechanism of this diffusion process. Gas absorption theory and methods of calculation may be well understood by reference to the literature cited in this paper.

It has been shown[1] that the equilibrium conditions between the gas and liquid involved and the rate at which this equilibrium is approached are of primary consideration in the study of gas absorption. Temperature and pressure within the absorption apparatus determine the equilibrium conditions for a given liquid—gas system, while the rate of approach is affected by such variables as the type of absorption equipment, gas velocity, liquor velocity, solubility of the gas in the liquid, temperature (this variable has an effect independent of its effect on equilibrium conditions), and possibly others.

The use of film coefficients[2] affords a convenient means of expressing the rate of diffusion of the gas into the liquid. Moreover, gas absorption calculations are greatly simplified if the solute gas obeys Henry's law[3], that is, if the equilibrium curve (gas concentration in the liquid plotted against partial pressure of the gas) is a straight line, or is substantially straight over the range of compositions involved. Henry's law constants calculated from the equilibrium data[4] given for the system—SO_2 in water—vary somewhat within the concentration range investigated herein, but the difficulty of formulation and evaluation of mathematical equations to express the laws governing reaction rates, and indeed the absence of exact and precise knowledge of these laws, combine to reasonably justify the assumption that Henry's law applies. Actually the deviation in the Henry's law constant from inlet to exit conditions in the absorption apparatus amounts to 0.94 per cent at the highest temperature condition of the test runs (34.5 deg. C.) and an average of 3.94 per cent deviation at the lowest temperature (29.5 deg. C.), with a maximum observed deviation at the lower temperature of 4.4 per cent.

Having made this assumption, overall gas film coefficients may be determined from the simplified equation

$$\frac{dW}{d\theta} = K_g\, a\, V\, (\Delta P)_{mean}$$

where

$\frac{dW}{d\theta}$ = rate of gas absorption (pounds of SO_2/hour).

K_g = overall absorption coefficient (pounds of SO_2/hr./sq. ft. of absorption area/atmpospheric partial pressure difference).

a = area of absorption surface (sq. ft./cu. ft. of tower volume)

V = packed volume of tower (cu. ft.)

$(\Delta P)_{mean}$ = logarithmic partial pressure difference (atmospheres)

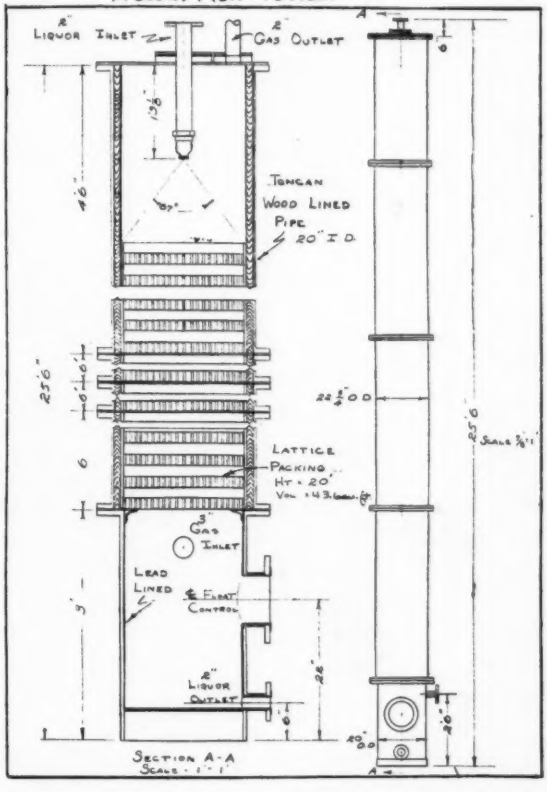
$$= \frac{(\Delta P)_1 - (\Delta P)_2}{2.303 \log \frac{(\Delta P)_1}{(\Delta P)_2}}$$

$(\Delta P)_1$ = partial pressure of solute gas in the gas phase minus the vapor pressure of solute gas from the liquid phase at one end of the system.

$(\Delta P)_2$ = corresponding difference at the other end of the system, where $(\Delta P)_1$ is greater than $(\Delta P)_2$

(The system of units is optional with the writer, any system of corresponding units being permissible).

Gas absorption rates $\frac{(dW)}{(d\theta)}$ *were calculated* from the SO_2 concentration in the liquor entering and leaving the absorber and from the liquor rate; $(\Delta P)_m$ from the equilibrium data and from pressure measurements; (V) is the calculated packed tower volume and is a constant; (a) is calculated from the dimensions of the tower and tower packing and is also a constant; (K_g) is the unknown in the equa-

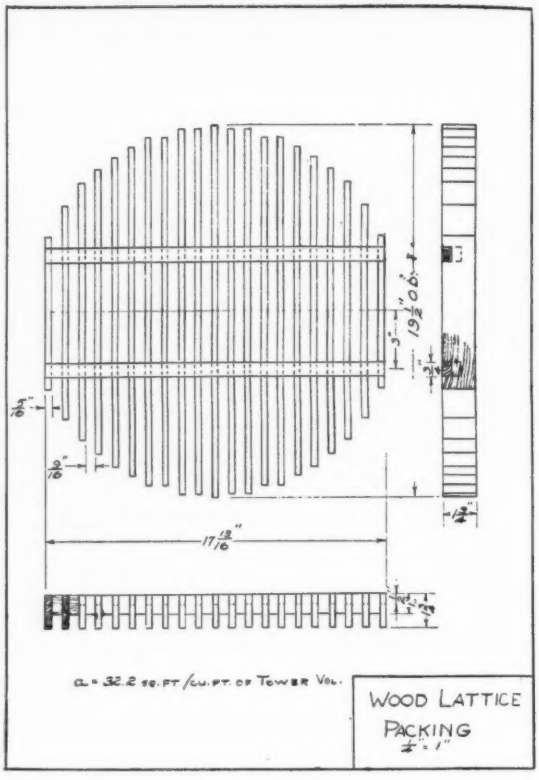


* Presented at the Fall Meeting of the Technical Association of the Pulp and Paper Industry, Northland Hotel, Green Bay, Wis., Sept. 8-10, 1938.

[1] Chemical Engineer, Kimberly-Clark Corporation, Neenah, Wis.

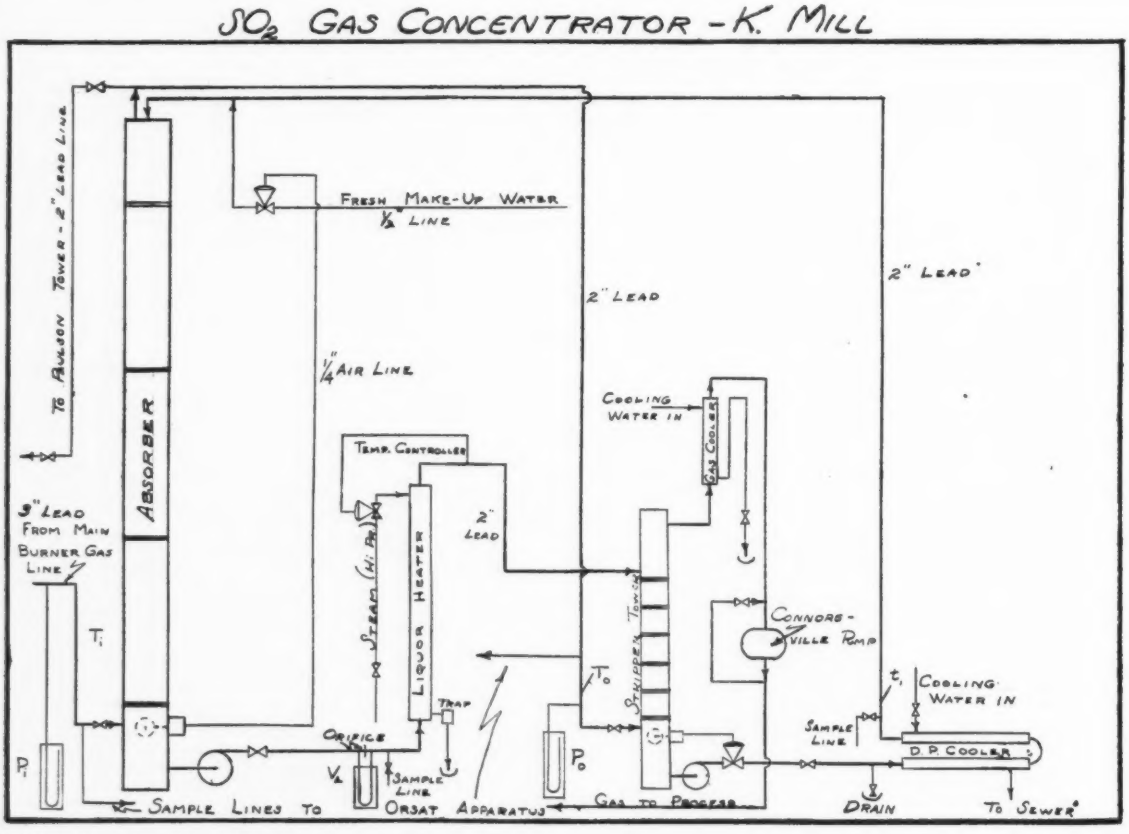
tion, and its determination under known operating conditions affords the basis of future design calculations, since by duplication of the operating conditions (type of absorption equipment, liquor rate, gas rate, temperature, pressure, etc.) one can predict the performance of proposed absorption equipment.

According to Lewis and Whitman[1] less soluble gases are best absorbed in apparatus in which the gas bubbles up through the liquid, because in such cases the liquid film offers the greatest resistance to gas diffusion and a rising gas bubble would continuously expose fresh liquid surface, with the result that the "conductivity" of the liquid film would be relatively high. On the other hand, more soluble gases are best absorbed in apparatus in which a liquid is sprayed on the rising gas, because in this case the gas film offers the greatest resistance to gas diffusion, and a falling drop might be expected to have a very thin gas film and a relatively thick liquid film. In the case of an intermediately soluble gas, such as SO_2 in water, it might reasonably be expected that the type of absorption equipment used would determine which film would control, i.e., the gas film would control when SO_2 is bubbled up through water, and the liquid film would control when SO_2 is passed over a free surface of liquid. This assumption is borne out by Adams[5] who used a tile packed tower to absorb SO_2 in water and found that the liquid film actually was the controlling film in this case where SO_2 is passed over a free liquid surface.



Equipment and Procedure

The information reported in this paper is another



case of the passage of SO_2 over a free surface of water. In this case the absorption tower was packed with a series of wood-lattice grids, each unit laid at a 90 degree angle to the preceding packing unit. The tower was one unit of a standard mill installation designed to concentrate SO_2 gas from a spray-type sulphur burner to a sufficiently high percentage of SO_2 to enable the concentrated gas to be used in another phase of the paper making process. The absorber is used in conjunction with a stripping-tower, the SO_2 solution from the bottom of the absorber being pumped through a heater and into the stripper where the SO_2 is removed as a concentrated gas. The liquor from the stripper with its residual content of SO_2 is then pumped through a cooler and into the top of the absorber. The burner gas entering into the absorber at the bottom is bled off from the main gas line supplying SO_2 gas for the production of the cooking acid. The exit gases from the top of the absorber are divided, the main portion passing back into the acid making system, while a small volume is introduced into the bottom of the stripper to aid in the removal of SO_2 from the liquor. The absorption tower is of the construction shown in the diagram and is equipped with a float control operating through an air pilot valve and a diaphragm valve to maintain the liquid level in the tower constant by the addition of fresh water whenever necessary.

A combination of circumstances prevented the use of an orifice and manometer to determine the rate of gas flow. An orifice in the gas line of sufficiently small diameter to permit the use of mercury in the manometer created too great a restriction to the flow of gas, while larger orifices used in conjunction with water or carbon tetrachloride in the manometer were equally useless because of the difficulty in reading the manometer, a result of the rhythmic pressure variations in the main gas line. Consequently the rates of gas flow were calculated from the change in gas and liquor concentrations during passage through the absorber and from the liquor rate. Liquor rate was controlled by means of a hand valve which was set to allow the desired rate of flow as indicated on a manometer used in conjunction with a standard orifice. Liquor rate was maintained constant during any given run and was the only controllable variable. Since the absorber was actually engaged in plant production operations, it was not possible to study the effect of temperature on gas absorption, mill conditions making it essential that the absorber temperature be held at a minimum.

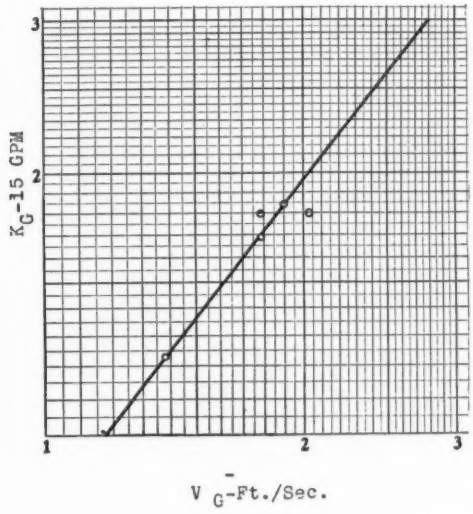


FIG. 1.
Effect of Gas Velocity on Overall Coefficient.

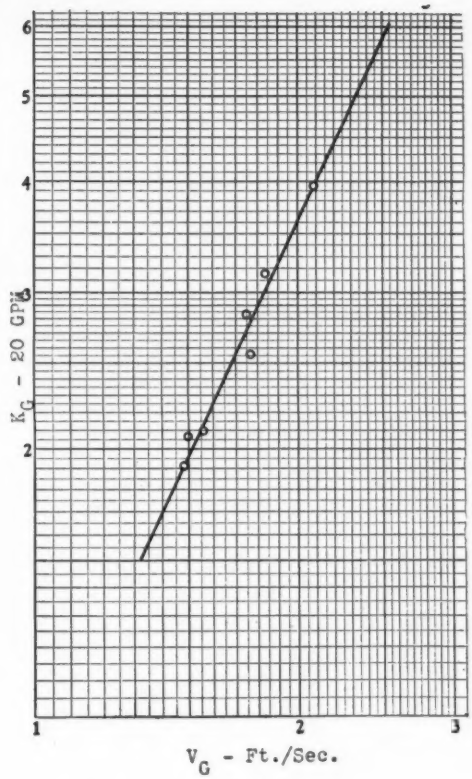


FIG. 2.
Effect of Gas Velocity on Overall Coefficient.

Inlet and exit gas pressures were measured with the usual mercury manometers. Atmospheric pressure data were obtained from the Wisconsin-Michigan Power Company. Inlet liquor temperature was determined by means of a thermometer in an oil-filled well, while a thermometer was placed in a bottle of the liquor to obtain the exit liquor temperature. Orsat apparatus was used to determine gas composition, employing mercury as a leveling medium and chromic acid as the SO_2 absorbant. Iodine solution with starch indicator was used to determine the SO_2 content of the liquor. All liquor tests were repeated until titrations were obtained within 1 cc. on the burette, the higher result being taken, since the agitation of SO_2 solutions tends to drive off SO_2. Preliminary comparison of this method to that employing an excess of iodine and back titration with $Na_2S_2O_3$ gave checking results for the low concentrations employed in this investigation. Care was taken to insure normal and uniform operating conditions before each run.

Discussion of Results

The effect of gas velocity on the rate of SO_2 absorption was first investigated by maintaining the

liquor rate constant at each of four velocities—15, 20, 25, and 30 gallons per minute, corresponding to 1.49, 1.99, 2.48, and 2.98 ft./min. and obtaining a correlation of gas velocity to overall absorption coefficient. Since the overall coefficient is a direct expression of the rate at which absorption is taking place, or, in other words, of the rate at which equilibrium is being approached, study of the factors which affect the overall coefficient is a study of the factors which affect gas absorption rate, and since time is an all-important factor in industrial processes, the purpose of the study of absorption coefficients becomes obvious. All data will be presented before any conclusions are drawn.

Figure 1 and Table I show the effect of gas velocity on overall coefficient when liquor velocity is maintained constant at 1.49 ft./min. (15 g.p.m.).

TABLE I.—EFFECT OF GAS VELOCITY ON RATE OF SO_2 ABSORPTION

No.	Temperature, deg. C.	Liquor Rate, Ft./min.	Gas Rate, Ft./sec.	K_g
1	30	1.49	1.38	1.23
2	29.5	1.49	1.79	1.69
3	29.5	1.49	1.79	1.80
4	29.5	1.49	1.90	1.84
5	29.5	1.49	2.03	1.80

The data is plotted on logarithmic paper so that each point may be presented with the same percentage of accuracy regardless of its magnitude. The equation of the line established by the data plotted in Fig. 1 is

$$K_g = 0.82\ V_g^{1.36}$$

Figure 2 and Table II present the effect of gas velocity on the rate of gas absorption at a higher liquor rate—1.99 ft./min. (20 g.p.m.).

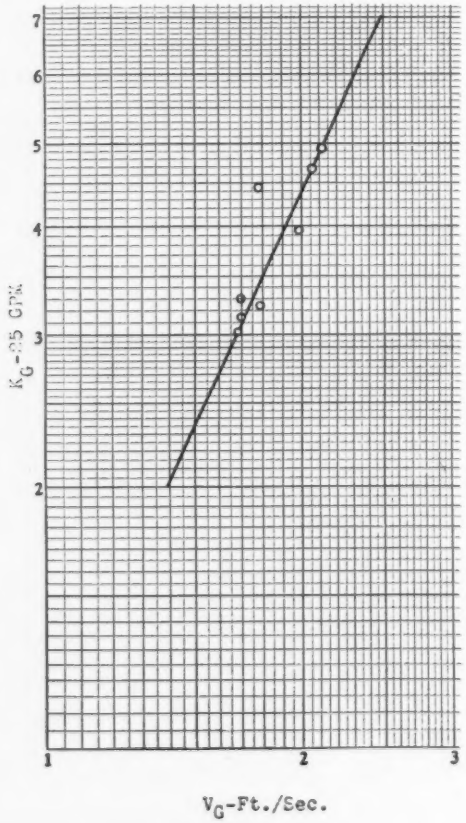


FIG. 3.
Effect of Gas Velocity on Overall Coefficient.

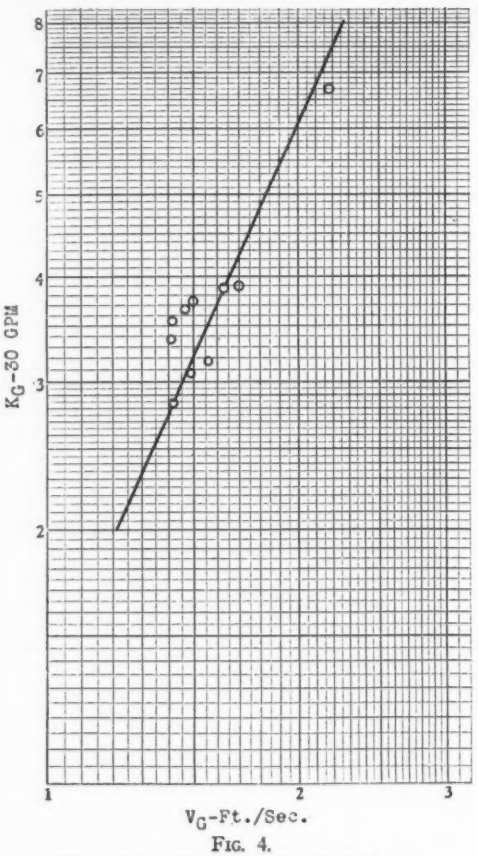


FIG. 4.
Effect of Gas Velocity on Overall Coefficient.

TABLE II.—EFFECT OF GAS VELOCITY ON RATE OF SO_2 ABSORPTION

No.	Temperature, deg. C.	Liquor Rate, Ft./min.	Gas Rate, Ft./sec.	K_g
1	32	1.99	1.48	1.91
2	32	1.99	1.50	2.07
3	32.5	1.99	1.56	2.10
4	31	1.99	1.77	2.56
5	31	1.99	1.75	2.84
6	32.5	1.99	1.84	3.16
7	31	1.99	2.09	3.96

The line of Fig. 2 is expressed by the equation

$$K_g = .83\ V_g^{2.11}$$

It will be noticed that at this increased liquor velocity the effect of gas velocity on the rate of gas absorption is greater than at the lower liquor velocity.

The effect of gas velocity on the rate of gas absorption at a still higher liquor rate (2.48 ft./min.—25 g.p.m.) is shown in Fig. 3 and Table III.

TABLE III.—EFFECT OF GAS VELOCITY ON RATE OF SO_2 ABSORPTION

No.	Temperature, deg. C.	Liquor Rate, Ft./min.	Gas Rate, Ft./sec.	K_g
1	34	2.48	1.68	3.02
2	34	2.48	1.70	3.15
3	34	2.48	1.79	3.24
4	33	2.48	1.70	3.30
5	31.5	2.48	1.99	3.96
6	33	2.48	1.78	4.45
7	31	2.48	2.06	4.69
8	31.5	2.48	2.12	4.93

Equation of line—Fig. 3 $K_g = .98\ V_g^{2.17}$

The effect of gas velocity on rate of absorption has increased only slightly over that found at a liquor rate of 1.99 ft./min.

Finally, in Table IV and Fig. 4 we see the effect

of gas velocity on absorption rate at the highest observed liquor rate, 2.98 ft./min. (30 g.p.m.).

TABLE IV.—EFFECT OF GAS VELOCITY ON RATE OF SO_2 ABSORPTION

No.	Temperature, deg. C.	Liquor Rate, Ft./min.	Gas Rate, Ft./sec.	K_g
1	34	2.98	1.42	2.84
2	33.5	2.98	1.49	3.08
3	34	2.98	1.56	3.18
4	34	2.98	1.41	3.38
5	33	2.98	1.42	3.54
6	33	2.98	1.47	3.66
7	33	2.98	1.50	3.74
8	32.5	2.98	1.63	3.88
9	34.5	2.98	1.70	3.90
10	32	2.98	2.18	6.70

Equation of line of Fig. 4

$$K_g = 1.28\ V_g^{2.26}$$

Again we see that the effect of gas velocity on rate of absorption has increased only slightly over the effect produced at 1.99 and 2.48 ft./sec. The first conclusion that we may draw from the data is that the effect of gas velocity on rate of gas absorption is more pronounced at high liquor velocities than at low. If we assume that the liquid film (reverting back to the two-film theory of gas absorption) offers more resistance to the passage of the SO_2 gas than does the gas film, or, in other words, if we assume that the liquid film is the controlling film, then at low liquor velocities the effect of gas velocity would not be so pronounced because of the relatively high resistance in the liquid film. At higher liquor velocities the increased turbulence would produce a decrease in the liquid film thickness, a corresponding decrease in the liquid film resistance, and the effect of gas velocity might be expected to be more noticeable. This is in accord with the data presented so far.

However, in Table V and Fig. 5 are shown the effect of liquor velocity on the rate of gas absorption. The temperature, gas velocity, and overall coefficient for each liquor velocity were obtained by averaging each of the four preceding tables. Then the equations for three of the Kg — Vg lines were used to correct the three corresponding average overall coefficients to the gas velocity of the fourth.

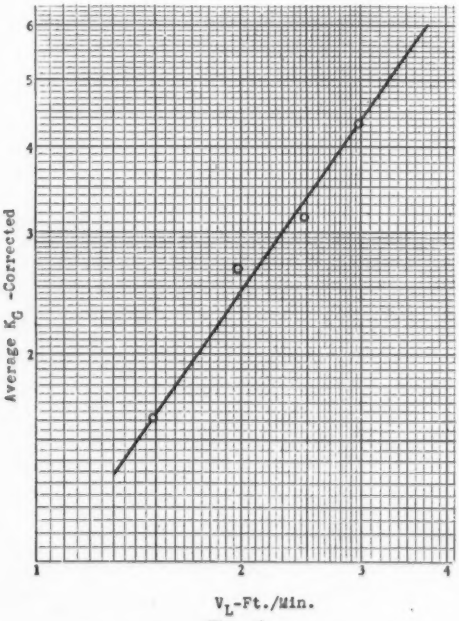


FIG. 5.
Effect of Liquor Velocity on Overall Coefficient.

TABLE V.—EFFECT OF LIQUOR VELOCITY ON RATE OF GAS ABSORPTION

No.	Average Temp. deg. C.	Liquor Rate, Ft./Min.	Ft./Sec.	Average Gas Rate, Ft./Sec.	Avg. K_g	Corrected* K_g
1	29.5	1.49	.0248	1.78	1.67	1.61
2	31.7	1.987	.0331	1.71	2.66	2.66
3	32.7	2.48	.0414	1.85	3.84	3.17
4	33.3	2.98	.0497	1.58	3.79	4.31

* Average K_g corrected to gas velocity of 1.71 ft./sec.
Equation of line—Fig. 5

$$K_g = .91\ V_L^{1.43}$$

Thus we see that the effect of liquor velocity on the rate of gas absorption exceeds the effect of gas velocity only at the lowest liquor rate, 1.49 ft./min., that is, at a liquor rate of 1.49 ft./min. (15 g.p.m.) the overall coefficient varies as the 1.26 power of gas rate, while at high liquor velocities it was found to vary with the 2.11, 2.17, and 2.26 power of the gas velocity as the case may be, and at all times with the 1.43 power of liquor velocity. Incidentally, the above Kg — V_L equation is expressed in liquor velocities of ft./min. while all other equations are expressed in gas velocities of ft./sec. However, the coefficient of V_L would remain unchanged, regardless of the units, only the constant being changed.

It seems evident, then, that the liquid film is the controlling film in this type of equipment at low liquor velocities and that the gas film is the controlling film at higher liquor velocities. It is quite probable that the more pronounced effect of gas rate at higher liquor rates is the result of the thinning of the liquid film due to increased turbulence so that it no longer offers the greatest resistance. Study of performance at liquor rates below 15 g.p.m. is desirable but impossible at present due to the production demand on the equipment. Rates above 30 g.p.m. are too dangerously close to the flooding point of the stripper tower used in conjunction with the absorber.

Previous investigation[6] has revealed that an increase in temperature decreases the resistance of the liquid film and increases the resistance of the gas film. It might reasonably be expected that the effect of temperature would be greater on the film exerting the greater influence on gas absorption. Thus, if the gas film controls, an increase in temperature would increase the resistance of the gas film more then it would decrease the resistance of the liquid film, so that the net effect would be an increase in the overall resistance, and, hence, a decrease in the rate of absorption and the overall coefficient. Although no attempt was made to control temperatures, the overall coefficients of Tables I, II, III, and IV, have been averaged for each temperature and tabulated together with the average gas velocity for each temperature in Table VI.

TABLE VI.—EFFECT OF TEMPERATURE ON RATE OF GAS ABSORPTION

Table	Liquor Rate, Ft./Min.	Avg. Gas Rate, Ft./Sec.	Temp., deg. C.	Avg. K_g
I	1.49	1.88	29.5	1.78
	1.49	1.38	30	1.23
II	1.99	1.87	31	3.12
	1.99	1.49	32	1.99
	1.99	1.70	32.5	2.63
III	2.48	2.06	31	4.69
	2.48	2.05	31.5	4.44
	2.48	1.74	33	3.87
	2.48	1.72	34	3.14
IV	2.98	2.18	32	6.70
	2.98	1.63	32.5	3.88
	2.98	1.46	33	3.65
	2.98	1.49	33.5	3.08
	2.98	1.46	34	3.13
	2.98	1.70	34.5	3.90

Inspection of Table VI will reveal that although the overall absorption coefficient does decrease with increasing temperature, it is more responsive to changes in the gas rate except at the highest liquor

TABLE VII—EXPERIMENTAL DATA

				Inlet Gas			Exit Gas			Liquor Composition—gms. SO_2/100 cc. sol'n.	
	No.	VL G.p.m.	Temp., deg. C.	SO_2, per cent	SO_2 Pressure, mm Hg	Total Pressure, mm Hg	SO_2 per cent	SO_2 Pressure, mm Hg	Total Pressure, mm Hg	Entering	Leaving
I	1	15	30	14.8	162	1096	10	105	1050	1.61	.50
	2	15	29.5	14.0	152.1	1088	9.2	96.9	1052	1.66	.24
	3	15	29.5	14.4	156.5	1088	9.5	99.7	1050	1.72	.26
	4	15	29.5	14.6	159	1090	9.9	104.5	1055	1.76	.26
	5	15	29.5	14.9	163	1093	10.4	109.8	1052	1.80	.26
II	1	20	32	15.8	172.8	1092	8.4	89.5	1064	1.64	.27
	2	20	32	15.8	173	1094	8.4	89.4	1063	1.67	.28
	3	20	32.5	14.2	159.9	1126	7.7	83.7	1088	1.54	.26
	4	20	31	14.6	160	1095	8.4	89.6	1067	1.67	.30
	5	20	31	14.7	160.9	1092	8.4	89.5	1064	1.70	.33
	6	20	32.5	13.3	149.1	1121	7.7	83.5	1083	1.54	.25
	7	20	31	14.0	152.2	1089	8.8	92.6	1051	1.67	.33
III	1	25	34	15.0	166.1	1108	8.9	95.9	1078	1.57	.54
	2	25	34	14.4	159.1	1106	8.5	91.8	1080	1.50	.50
	3	25	34	14.9	165	1108	9.0	97.6	1083	1.58	.52
	4	25	33	14.0	156.1	1115	9.1	98.7	1085	1.55	.71
	5	25	31.5	15.5	171.1	1105	9.2	97.4	1059	1.79	.53
	6	25	33	14.0	156.2	1117	9.4	102.0	1087	1.59	.76
	7	25	31	15.0	166.0	1107	8.9	94.5	1061	1.79	.53
	8	25	31.5	14.8	162.9	1100	8.8	93.1	1059	1.74	.48
IV	1	30	34	15.0	165.8	1104	9.2	99.1	1079	1.49	.80
	2	30	33.5	15.3	167.5	1094	8.8	93.5	1062	1.55	.70
	3	30	34	15.2	168	1106	9.5	103	1083	1.55	.80
	4	30	34	15.2	167.9	1104	9.0	96.8	1076	1.53	.80
	5	30	33	14.6	160.7	1100	8.2	87.6	1069	1.50	.75
	6	30	33	14.5	160	1102	8.2	88	1072	1.51	.74
	7	30	33	14.5	159.6	1100	8.5	90.9	1069	1.52	.77
	8	30	32.5	14.4	159.0	1102	9.1	97.8	1074	1.57	.85
	9	30	34.5	15.2	167.9	1103	9.5	102	1073	1.57	.76
	10	30	32	14.4	161	1119	11.3	122.1	1081	1.71	1.13

All gas analyses and calculations are reported on the dry basis.

rate. However, many of the drops in Kg with increasing temperature are out of all proportion to the decrease in gas rate, indicating that there is a definite temperature effect, and lending added support to our assumption that the gas film is the controlling film. If we are unwilling to accept the changeover from liquid film controlling at low liquor rates to gas film controlling at high liquor rates, then we must conclude that the liquid film controls at all times, that the turbulence produced by increased gas velocities produces a thinning of the liquid film, decreasing its resistance and increasing absorption rate, and that the more marked effect of gas velocities at high liquor velocities is the result of additional thinning of the liquid film because of the increased turbulence at the higher liquor rate. This conclusion would bring the results into agreement with previous investigation, that is, that in this type of equipment where the gas is passing over a liquid surface, the liquid film is the controlling film.

Literature Cited

(1) Absorption Symposium, Lewis & Whitman, "Principles of Gas Absorption", *Ind. Eng. Chem.*, 16, 1215 (1924).
(2) Lewis & McAdams, "Computation Methods in Countercurrent Absorption Systems", *Ind. Eng. Chem.*, 20, 253 (1928).
(3) Perry, Chem. Eng. Handbook, 1019, McGraw-Hill Book Company, Inc. New York (1934).
(4) International Critical Tables, 3, 302.
(5) Adams, "Absorption of SO_2 in H_2O", *Ind. Eng. Chem.* 25, 424 (1933).
(6) Haslam, Hershey, & Kean, "Effect of Gas Velocity and Temperature on Rate of Absorption", *Ind. Eng. Chem.*, 16, 1224 (1924).

E. A. Oberweiser Moves To Appleton

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., September 12, 1938—E. A. Oberweiser of Stevens Point, Wis., has moved to Appleton, Wis., and will reside with his family at 1110 E. North St. Mr. Oberweiser formerly was president and general manager of the Whiting-Plover Paper Company but retired last winter. While it is reported Mr. Oberweiser will be associated with an Appleton paper mill, no announcement has been made of his plans.

Decline in Argentine Casein Exports

With a slackening in foreign demand, the Argentine casein market has weakened considerably during the past six months, according to a report to the Department of Commerce by the office of the American Commercial Attache at Buenos Aires.

Exports during the first six months of 1938 have fallen off substantially while price quotations are at a very low level and current stocks are unusually high, the report stated.

Exports during the first six months of 1938 totaled 6,002 metric tons, reflecting marked declines compared with the 16,121 metric tons and 19,933 metric tons shipped during the corresponding periods of 1937 and 1936, respectively.

During the six month period of the current year, the United Kingdom with 1,501 metric tons, compared with 3,515 metric tons in the same period of 1937, was Argentine's best foreign customer for casein, and replaced Germany who purchased 1,315 metric tons in 1938 compared with 5,181 metric tons during the first half of 1937. Considerable declines were also noted in Argentine exports of casein to both the United States, 75 metric tons compared with 1,531 metric tons, and Japan with 732 metric tons during the six month period in 1938 compared with 2,071 during the same period last year.

The only country to record a gain in imports of Argentine casein exports during the first half of 1938 compared to the corresponding period of 1937 was Poland who received 168 metric tons during the 1938 period compared to 100 metric tons during the corresponding period in 1937, according to the report.

Bantam Roller Bearings

A special Bulletin No. 103-G, has just been issued by the Bantam Bearings Corporation, South Bend, Ind., describing and giving full engineering facts of the new heavy duty needle roller bearing known as the Standard Quill Bearings, for shafts from ¾ inch to 5 inches. Users of bearings for heavy radial loads are invited to write for a copy.

Imports of Paper and Paper Stock

Giving Manifests of New York, Boston, Philadelphia and Other Ports of Newsprint, Wrapping, Writing, Coated, Blotting, Tissue, Strawboard, Wallboard, Cigarette Papers, Sulphite, Kraft and Ground Wood Pulp.

NEW YORK IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

SUMMARY

Cigarette paper .....107 cs.
Wall paper .....3 crates, 5 cs.
Paper hangings .....2 pkgs., 3 bls.
Newsprint .....11,753 rolls, 43 bls.
Printing paper .....80 bls., 12 cs.
Filter paper .....11 cs.
Wrapping paper .....198 rolls, 4 pkgs., 36 bls., 9 cs.
Surface coated paper .....41 cs.
Surface baryta coated paper .....30 cs.
Imitation Parchment paper .....24 cs.
Decalcomania paper .....13 cs.
Decalcomanias .....11 cs.
Transparent paper .....2 cs.
Tracing cloth .....20 cs.
Tracing paper .....2 cs.
Copying paper .....2 cs.
Writing paper .....5 cs.
Gummed paper .....4 cs.
Wood pulp paper .....4 cs.
Paper tubes .....94 cs.
Miscellaneous paper .....4 cs.

CIGARETTE PAPER

Champagne Paper Corp., *Ile de France,* Havre, 100 cs.
Braunstein Freres, Inc., *Ile de France,* Havre, 7 cs.

WALL PAPER

American Express Co., *Ile de France,* Havre, 2 cs.
Heemsoth Kerner Corp., *Bremen,* Bremen, 1 crate.
J. F. Kilroy Co., *Bremen,* Bremen, 2 crates, 3 cs.

PAPER HANGINGS

W. H. S. Lloyd & Co., *American Trader,* London, 3 bls.
W. H. S. Lloyd & Co., *Samaria,* Liverpool, 2 pkgs.

NEWSPRINT

News Syndicate Co., *Louisianan,* Comeau Bay, 5950 rolls.
Jay Madden Corp., *Columbus,* Bremen, 304 rolls.
Jay Madden Corp., *Normactide,* Kotka, 644 rolls.
Jay Madden Corp., *Scanpenn,* Kotka, 537 rolls.
Lunham & Reeve, Inc., *Scanpenn,* Kotka, 171 rolls.
N. Y. Evening Journal, *Mandi,* Quebec, 612 rolls.
Daily Mirror, Inc., *Mandi,* Quebec, 1938 rolls.
H. G. Craig Co., Inc., *Newscarrier,* Donnacona, 325 rolls.
H. G. Craig, *A.C.D.,* Donnacona, 345 rolls.
Perkins Goodwin & Co., *Hamburg,* Hamburg, 64 rolls.
Jay Madden Corp., *Hamburg,* 202 rolls.
Jay Madden Corp., *Pr. Roosevelt,* Hamburg, 403 rolls, 43 bls.
N. Y. Evening Journal, *Pr. Roosevelt,* Hamburg, 259 rolls.

PRINTING PAPER

R. J. Saunders, *Queen Mary,* Southampton, 4 cs.
Walker Goulard Plehn Co., *Mormactide,* Kotka, 80 bls.
E. Dietzgen & Co., *Hamburg,* Hamburg, 8 cs.

WRAPPING PAPER

Steiner Paper Corp., *Hamburg,* Hamburg, 9 cs.
F. C. Strype, *A. van Opstal,* Antwerp, 4 pkgs.
Jay Madden Corp., *Pr. Roosevelt,* Finland, 36 bls., 198 rolls.

FILTER PAPER

H. Reeve Angel & Co., Inc., *American Trader,* London, 10 cs.
———, *Hamburg,* Hamburg, 1 cs.

SURFACE COATED PAPER

Gevaert Co. of America, *Black Condor,* Antwerp, 37 cs.
J. J. Gavin Co., *Hamburg,* Hamburg, 4 cs.

SURFACE BARYTA COATED PAPER

L. A. Consmiller, *Bremen,* Bremen, 30 cs.

IMITATION PARCHMENT PAPER

E. Dietzgen & Co., *Hamburg,* Hamburg, 24 cs.

DECALCOMANIA PAPER

B. F. Drakenfeld & Co., *Samaria,* Liverpool, 5 cs. (duplex) 8 cs. (simplex).

DECALCOMANIAS

Sellers Transportation Co., *Hamburg,* Hamburg, 2 cs.
Sellers Transportation Co., *Bremen,* Bremen, 9 cs.

TRANSPARENT PAPER

Globe Shipping Co., *Bremen,* Bremen, 2 cs.

TRACING CLOTH

C. Bruning Co., Inc,. *Bremen,* Bremen, 20 cs.

TRACING PAPER

E. Dietzgen & Co., *Hamburg,* Hamburg, 2 cs.

COPYING PAPER

Roneo Co., *American Trader,* London, 2 cs.

WRITING PAPER

H. W. Robinson Co., *Hamburg,* Hamburg, 5 cs.

GUMMED PAPER

Heemsoth Kerner Corp., *Bremen,* Bremen, 4 cs.

WOOD PULP PAPER

———, *Hamburg,* Hamburg, 4 cs.

PAPER TUBES

———, *Hamburg,* Hamburg, 94 cs.

MISCELLANEOUS PAPER

W. H. S. Lloyd & Co., *Ile de France,* Havre, 4 cs.

RAGS, BAGGINGS, ETC.

Chase National Bank, *American Trader,* London, 54 bls., 1100 bdls. bagging.
Manufacturers Trust Co., *Samaria,* Liverpool, 14 bls. rags.
Burros Bag Co., Inc., *N. Amsterdam,* Rotterdam, 40 bls. bagging.
Darmstadt Scott & Courtney, *Vigrid,* Gdynia, 65 bls. bagging.
D. M. Hicks, Inc., *West Cusseta,* Havre, 32 bls. rags.
J. Cohen & Son Co., Inc., *West Cusseta,* Havre, 7 bls. rags.
J. Cohen & Son Co., Inc., *West Cusseta,* Dunkirk, 16 bls. rags.
E. J. Keller Co., Inc., *West Cusseta,* ———, 88 bls. rags.
Philadelphia National Bank, *Quaker City,* Liverpool, 20 blds. bagging.
Darmstadt Scott & Courtney, *Scanpenn,* Copenhagen, 5 bls. bag scrap.
———, *Scanpenn,* Copenhagen, 167 bls. bagging.
Hughes Fawcett, Inc., *Gerolstein,* Antwerp, 14 bls. flax waste.
Castle & Overton, Inc., *Black Condor,* Rotterdam, 74 bls. bagging.
Darmstadt Scott & Courtney, *Black Condor,* Rotterdam, 182 bls. bagging.
Stone Klous & Co., Inc., *Black Condor,* Rotterdam, 2 bls. cloth scrap.
Royal Manfg Co., *Black Condor,* Antwerp, 9 bls. cotton waste.
E. J. Keller Co., Inc., *Black Condor,* ———, 150 bls. bagging.
———, *Helvig,* Alexandria, 150 bls. rags, 110 bls. bagging, 300 bls. tares.
Continental Bank Trust Co., *Beemsterdyk,* Rotterdam, 30 bls. scrap press cloth.
Royal Manfg Co., *A. van Opstal,* Antwerp, 97 bls. cotton waste.
E. J. Keller Co., Inc., *Extavia,* ———, 242 bls. paper stock.
E. J. Keller Co., Inc., *American Importer,* ———, 62 bls. bagging.

OLD ROPE

W. Steck & Co., *West Cusseta,* Havre, 144 coils.

Banco Coml Italiane Trust Co., *Scanpenn,* Copenhagen, 98 coils.
E. J. Keller Co., Inc., *Beemsterdyk,* ———, 72 coils.

CHINA CLAY

English China Clays Sales Corp., *Samaria,* Liverpool, 160 bags, 10 tons.

WOOD PULP

Bulkley Dunton Pulp Co., Inc., *Mormactide,* ———, 1800 bls. sulphite, 304 tons.
M. Sone, *Mormactide,* Stockholm, 600 bls. sulphite, 101 tons.
Pulp Sales Corp., *Mormactide,* Wiborg, 2100 bls. sulphite, 420 tons.
Abdorbo Beer Pad Co., *Vulcania,* Trieste, 1105 bls. wood pulp.
Abdorbo Beer Pad Co., *Pr. Roosevelt,* Hamburg, 26 bls. wood pulp.
Pagel Horton & Co., Inc., *Hjelmaren,* Sweden, 375 bls. sulphite, 1665 bls. sulphate.
Tradesman's Natl Bank Trust Co., *Hjelmaren,* Sweden, 250 bls. sulphite.
Price & Pierce, Ltd., *Hjelmaren,* Sweden, 150 bls. sulphite.
Bulkley Dunton Pulp Co., Inc., *Hjelmaren,* ———, 3025 bls. sulphite, 2500 bls. sulphate.
M. Sone, *Hamburg,* Hamburg, 392 bls. wood pulp, 53 tons.
———, *Hamburg,* Hamburg, 510 bls. wood pulp, 51 tons.
Castle & Overton, Inc., *Hamburg,* Hamburg, 1550 bls. wood pulp, 310 tons.
Mead Sales Co., *Vestvard,* Sundsvall, 1000 bls. sulphite, 200 tons.
Johaneson Wales & Sparre, Inc., *Vestvard,* 4115 bls. sulphite, 758 tons; 600 bls. sulphate, 100 tons.
M. Sone, *Vestvard,* Sundsvall, 300 bls. dry pulp, 50 tons.
Bulkley Dunton Pulp Co., Inc., *Vestvard,* ———, 1025 bls. sulphite, 175 tons.
Johaneson Wales & Sparre, Inc., *Vestvard,* Obbola, 2450 bls. sulphate, 350 tons.
Bank of The Manhattan Co., *Vestvard,* Hernosand, 7410 bls. sulphate, 1235 tons; 8800 bls. sulphite, 1405 tons.
M. Sone, *Hansa,* Hamburg, 510 bls. woodpulp.
M. Sone, *Belos,* Hernosand, 300 bls. woodpulp.

PULP WOOD

International Paper Co., *Heimgar,* Sheet Harbor, N. S., 1600 cords.

WOOD PULP BOARDS

Jay Madden Corp., *Mormactide,* Kotka, 50 rolls.
Jay Madden Corp., *Scanpenn,* Wiborg, 24 bls.
Jay Madden Corp., *Scanpenn,* Kotka, 185 bls., 36 rolls.
Absorbo Beer Pad Co., *Pr. Roosevelt,* Hamburg, 80 bls., (sheets).

ALBANY IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

Halifax Power & Pulp Co., *Haukefjell,* Sheet Harbor, N. S., 10210 bls. mechanically ground pulp.

PORTLAND IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

M. Sone, *Laura C.,* Trieste, 400 bls. wood pulp.
Chase National Bank, *Laura C.,* Trieste, 6591 bls. wood pulp.

BOSTON IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

Elliott Addressing Machine Co., *Tai Yang,* Yokohama, 14 cs. paper.
Gottesman & Co., Inc., *Bockenheim,* Sweden, 935 bls. unbleached sulphite; 500 bls. bleached sulphite.
Pagel Horton & Co., Inc., *Bockenheim,* Sweeden, 1250 bls. woodpulp.
M. Sone, *Vingaren,* Stockholm, 300 bls. wood pulp.
E. J. Keller Co., Inc., *Exochorda,* ———, 161 bls. paper stock.

PHILADELPHIA IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

F. Weber & Co., *Exhibitor,* Genoa, 4 cs. paper.
Chase National Bank, *Laura C.,* Trieste, 173 bls. wood pulp.
The Lang Co., *West Cusseta,* Havre, 402 bls. rags.
Castle & Overton, Inc., *West Cusseta,* Havre, 48 bls. new cuttings.
E. J. Keller Co., Inc., *West Cusseta,* ———, 156 bls. new cuttings.
Pulp Sales Corp., *Scanpenn,* Wiborg, 4154 bls. sulphite, 750 tons.
Pulp Sales Corp., *Scanpenn,* Kotka, 185 bls. sulphite, 37 tons.
Jay Madden Corp., *Scanpenn,* Kotka, 200 bls. wood pulp boards, 31 tons.
Wilkinson Bros. & Co., Inc., *Scanpenn,* Kotka, 59 rolls newsprint.
J. W. Hampton, Jr. & Co., *Scanpenn,* 330 rolls newsprint.
J. M. Hagy Waste Works, *Black Condor,* Antwerp, 45 bls. rags.
———, *Black Condor,* Antwerp, 37 bls. wrapping paper.
Corn Exchange Bank Trust Co., *Beemsterdyk,* Rotterdam, 9 cs., 11 rolls basic board.
Bank of The Manhattan Co., *Vestvard,* Hernosand, 2560 bls. sulphite, 402 tons.
Johaneson Wales & Sparre, Inc., *Vestvard,* Sundsvall, 330 bls. sulphite, 66 tons.
Perkins Goodwin & Co., *Vestvard,* Sundsvall, 720 bls. sulphate, 120 tons.
M. Sone, *Vestvard,* Sundsvall, 1200 bls. dry pulp, 200 tons.
Atterbury Bros., Inc., *Vestvard,* Sundsvall, 750 bls. dry pulp.
Johaneson Wales & Sparre, Inc., *Vestvard,* Sundsvall, 3000 bls. sulphite, 600 tons.
Mead Sales Co., *Vestvard,* Sundsvall, 2880 bls. sulphite, 480 tons.
Bulkley Dunton Pulp Co., Inc., *Vestvard,* ———, 1100 bls. sulphate, 220 tons.
E. J. Keller Co., Inc., *City of Flint,* ———, 48 bls. new bagging, 94 bls. old bagging.

CAMDEN IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

Pagel Horton & Co., Inc., *Vestvard,* Munksund, 1500 bls. sulphate, 250 tons.

WILMINGTON IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

Pulp Sales Corp., *Scanpenn,* Wiborg, 5135 bls. sulphite, 1027 tons.
Jay Madden Corp., *Scanpenn,* Kotka, 1176 rolls wood pulp boards, 136 tons.

BALTIMORE IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

M. Sone, *Soloy,* Sundsvall, 5400 bls. wood pulp.
Chase National Bank, *Laura C.,* Trieste, 1381 bls. wood pulp.
———, *Laura C.,* Trieste, 539 bls. wood pulp.
———, *Quaker City,* Liverpool, 136 coils old rope.
———, *Beemsterdyk,* Rotterdam, 107 bls. wood pulp boards.

NORFOLK IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

N. Y. Trust Co., *Quaker City,* Liverpool, 101 bls. bagging.
National City Bank, *Quaker City,* Liverpool, 500 bdls. waste sacking.
Irving Trust Co., *Beemsterdyk,* Rotterdam, 129 bls. bagging, 88 bls. rags.

NEWPORT NEWS IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

Gottesman & Co., Inc., *Trolleholm,* Sweden, 1150 bls. unbleached sulphite.

NEW ORLEANS IMPORTS

WEEK ENDING SEPTEMBER 10, 1938

Darmstadt Scott & Courtney, *Vigrid,* Gdynia, 129 bls. bagging.

J. Andersen & Co.

Selling Agents

21 East 40th Street

New York

CHEMICAL & MECHANICAL PULP

Kraft Pulp

BERGVIK OCH ALA NYA AKTIEBOLAG
Söderhamn, Sweden
KAMK TRÄINDUSTRI AKTIEBOLAG
Venoffärden, Sweden
MUNKSUNDS AKTIEBOLAG
Munksund, Sweden
NEMSJÖ CELLULOSA A.-B.
Sprängsvikan, Sweden

Bleached Sulphite

KELLNER-PARTINGTON PAPER PULP CO., LTD.
Sarpsborg, Norway
Edsvalla, Sweden
Hallein & Vilach, Austria

Unbleached Sulphite

AKTIESELSKABET GREAKER CELLULOSEFABRIK
Greaker, Norway
BERGVIK OCH ALA NYA AKTIEBOLAG
Söderhamn, Sweden
CELLULOSEFABRIKS A.-G.
Bratislava, Czecho-Slovakia
SVANÖ AKTIEBOLAG
Svanö, Sweden

THE DRAPER FELTS

All kinds and styles of Felts for all kinds and styles of Papers.

Write us about your Felt problems and let us help you reduce your Felt Costs—we will call anywhere at any time.

DRAPER BROS. COMPANY

CANTON, MASS.

Woolen manufacturers since 1856

Mundt

Perforated Screens

For Pulp and Paper Mills

Steel, Copper, Brass
Bronze, Monel Metal
and Other Alloys
Punched for Centrifugal
and Rotary Screens,
Pulp Washers, Drainer
Bottoms, Filter Plates, etc.

Charles Mundt & Sons
67 Fairmount Ave. Jersey City, N. J.

ENGLISH ECCO CLAYS CLAYS

TRADE MARK

UNIFORM • SUPERIOR • DEPENDABLE

English China Clays Sales Corporation
551 Fifth Avenue, New York City

New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, September 14, 1938.

Although no substantial improvement in the demand for many grades of paper is reported in the wholesale market for the week, the prevailing opinion seems to be that the uptrend continues, with the expectation of a gradual broadening of consumer demand. The Labor Day holiday retarded business to some extent and September "got off" to a rather late start.

The continuation of the uptrend in general businesss is an encouraging factor in the present situation. The index of general business activity now stands at 85.5 per cent, up approximately .7 per cent higher than last week and 9.2 per cent higher than the low point of the year, which occurred the last of June. The production ratio of over 160 paper mills manufacturing all grades of paper, but very little newsprint, is around 77.2 per cent, compared with 80.1 per cent on August 27, and with 80.7 per cent on September 4, 1937. Production in August, 1936 was 80.5 per cent, and 70.9 per cent for August 1935. Sales volume for July and August of this year is quite widely reported as higher than for the preceding months, with June the low month. In general, manufacturers agents, jobbers and wholesale paper merchants reported the volume of August business under that of July but higher than in June.

The demand for newsprint is reported as little changed for the week. The severe curtailment of newspaper advertising which resulted in a decline in the consumption of newsprint to around 30 per cent, has had a depressing effect on this market. The trend in consumer demand now, however, is quite generally believed to have started upward and appreciable improvement is looked for by next month. Prices continue firm and no change in prevailing quoted market quotations is expected in the trade.

Some improvement in the demand for some grades of sulphite papers is reported this week. The demand for writing papers continues somewhat below expectations but considerable optimism is reflected in this division of the industry and a substantial improvement is looked for in the near future. Production and demand for tissue papers continues good and the uptrend trend in production and consumption of practically all grades of kraft papers continues at a relatively high level.

By and large, the basic factors underlying the paper market encourage the belief that the slight improvement now reported in some quarters, will soon broaden out to include the entire market and result in a steady increase in sales volume. Prices of practically all grades of paper continue firm and no change is expected in the trade in the immediate future.

Mechanical Pulp

Contract prices on all grades of domestic, Canadian and European mechanical pulp are none too firm and the current quotations on moist and dry imported mechanical pulp range from $25 to $28 per ton, with Canadian and domestic delivered quotations ranging from $27.50 to $30.00 per ton, delivered.

Chemical Pulp

The trend in prices of chemical pulp is apparently headed downward for the current week. A considerable spread in spot quotations has been reported and while there is less good pulp being sold close to and under cost than in the past, some producers are apparently continuing to supply relatively small lots at unprofitable prices. Lower prices are reported this week on practically all brands of chemical pulp, prime bleached sulphite now being quoted at from $48 to $55 per ton, domestic or southern kraft at from $30 to $38 per ton, f.o.b., pulp mill. The outlook in the near future is not encouraging, either in demand or prices and little optimism is reflected in the pulp trade for the current week.

Old Rope and Bagging

Business is reported as light in the old rope market. Prices are quite firm and continue unchanged at prevailing quoted market quotations. The demand for old bagging is light and conditions are unchanged, with prices holding firm at prevailing levels.

Rags

Trading in all grades of rags remains dull. Prices continue to hold firm for all grades of new and old domestic rags, with the exception of No. 2 roofing rags which are a little lower for this week. The foreign rag market is inactive and nominal prices prevail.

Waste Paper

The demand for all grades of waste paper is reported as very light for the week. No change in mill demand is reported and little change in either demand or prices is expected in the trade in the near future. Prices hold relatively firm on all grades.

Twine

Business in the twine market is under expectations. Somewhat more optimism is apparent in the market but no important change in demand or prices are looked for in the immediate future, though a longer view in the market is for a gradual improvement at the end of the month.

Hammermill's Share in Rayonier

The Hammermill Paper Company of Erie, Pa., owned 132,269 shares of common stock of Rayonier, Inc., on April 30, or 13.72 per cent of the total issue, Rayonier, Inc., has reported to the SEC. Edward M. Mills, president of the company, owned 99,476 common shares, or 10.32 per cent, on the same date.

SCREENS
for PAPER and PULP MILLS

PERFORMANCE of your Centrifugals, Shakers and Drainers definitely improved by the use of precision screens built to your specifications. Let us "sit in" on your screening problems.

The Harrington & King PERFORATING Co.

5652 FILLMORE ST., CHICAGO—114 LIBERTY ST., NEW YORK

DYESTUFFS
for BEATER, CALENDER or COATED PAPERS

CIBA
COMPANY
INCORPORATED
NEW YORK
CIBA COMPANY, LIMITED
MONTREAL, P. Q., CANADA
Representing
Society of Chemical Industry in Basle,
Vat Dyes of the
Dow Chemical Company, Incorporated
OFFICES
IN MAIN TEXTILE CENTRES

Knox Felts

EXCELSIOR Knox Woolen Co. Camden, Me. FELTS & JACKETS

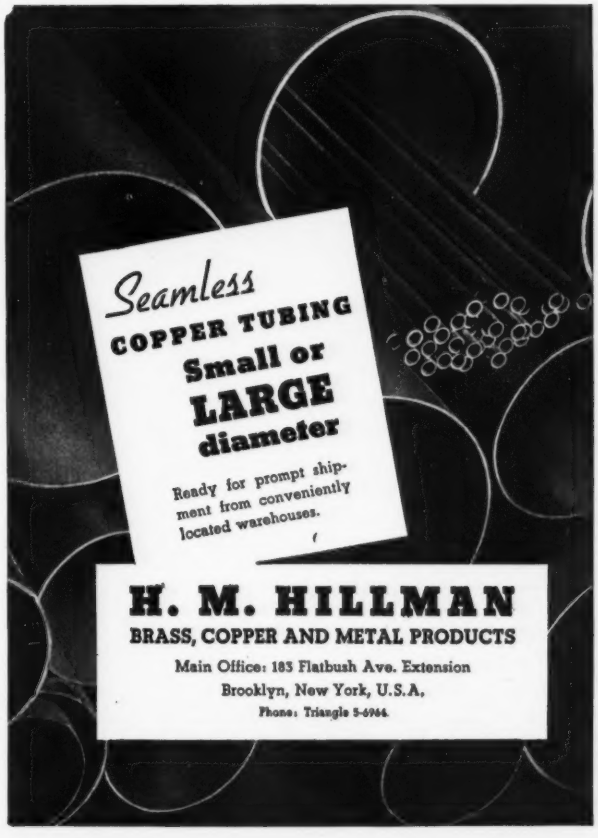
HIGH POROSITY

. . . as a characteristic of a paper maker's felt will, not only add to the life of felt, but saves time lost on the machine due to excessive shut downs for washing. Specify

EXCELSIOR FELTS

and minimize this trouble. Made by the Knox Woolen Co., of Camden, Maine, since 1864.

BULKLEY, DUNTON & CO.
295 Madison Ave. New York, N. Y.
CAledonia-5 5260-68



H. M. HILLMAN
BRASS, COPPER AND METAL PRODUCTS
Main Office: 183 Flatbush Ave. Extension
Brooklyn, New York, U.S.A.
Phone: Triangle 5-6964

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, September 14, 1938.

BLANC FIXE—Quotations on blanc fixe continue firm and unchanged at prevailing market prices. The pulp is offered at from $42.50 to $45 per ton, in bulk; the powder is quoted at from 3½ to 3¾ cents per pound in barrels at works.

BLEACHING POWDER—The price of bleaching powder is unchanged and conforms to prevailing market quotations. Bleaching powder is quoted at from $2 to $2.25 per 100 pounds, in drums, at works.

CASEIN—The demand for casein is reported as fair for the week. Domestic ground casein is quoted at 10 cents per pound; domestic finely ground at 10½ cents per pound; all prices in bags, car lot quantities.

CAUSTIC SODA—Prices on caustic soda continue firm and unchanged at prevailing market quotations. Solid caustic soda is quoted at from $2.10 to $2.30 per 100 pounds; flake and ground at from $2.50 to $2.75 per 100 pounds, in drums at works.

CHINA CLAY—Quotations on china clay continue firm and unchanged at prevailing market levels. Imported clay is quoted at from $14.50 to $25 per ton, ship side. Domestic filler clay is offered at from $6.50 to $12 per ton; coating clay at from $11 to $22 per ton, at mines.

CHLORINE—Quotations on chlorine are firm and unchanged at prevailing market prices. Chlorine is offered at $2.15 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The demand for rosin is reported as good for the week. Prices are a little higher. "G" gum rosin is quoted at $4.20; "FF" wood rosin at $4.15 per 280 pounds, gross weight, in barrels, at Savannah. Seventy per cent gum rosin size is quoted at $2.51 per 1000 pounds, f.o.b., shipping point.

SALT CAKE—Quotations on salt cake remain firm and conform to prevailing market quotations. Prices range at from $12 to $13.50 per ton; chrome salt cake at from $11 to $12 per ton, f.o.b., shipping point. Imported salt cake is quoted at from $14.50 to $15 per ton, Gulf or Atlantic Seaboard, on dock.

SODA ASH—Quotations on soda ash are reported as firm and conform to prevailing market quotations. Prices on soda ash in car lots, at works, per 100 pounds, are as follows: in bulk, $.90; in bags, $1.05; and in barrels, $1.35.

STARCH—The demand for corn starch is reported as good. Prices remain quite firm and are unchanged at prevailing market levels. Globe pearl is quoted at $2.45 per 100 pounds, in bags, and at $2.70 in barrels. Special paper starch is quoted at $2.55 per 100 pounds, in bags, and at $2.80 in barrels; all prices in car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Quotations on sulphate of alumina remain firm and unchanged at prevailing market prices. The commercial grades are quoted at $1.15; iron free at $1.30 per 100 pounds, in barrels, car lot quantities, f.o.b., works.

SULPHUR—The demand for sulphur is reported as good. Prices remain firm and continue unchanged at prevailing market levels. Annual contracts are quoted at $18 per long ton, f.o.b., cars at mines. The quotation on spot and nearby car lots is $21 per ton.

TALC—The prices of talc are firm and conform to prevailing market quotations. Domestic talc is offered at from $15 to $18 per ton, Eastern mines. Imported talc is quoted at from $25 to $40 per ton, on dock.

Market Quotations

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	●	—
Sheets	58.00	●	—
Kraft—per cwt.—Delivered Zone A			
No. 1 Northern	$5.25	@	—
Superstandard	4.12½	@	5.00
Northern Standard Wrapping	4.50	@	—
Standard Wrapping	4.00	@	—
Tissues—Per Ream—Carlots			
White No. 1	.92½	●	—
White No. 1 M. G.	.90	●	—
White No. 1½	.67½	●	—
White No. 2	.60	●	—
Anti-Tarnish M. G.	.75	●	—
Colored	.87½	●	—
Kraft	.75	●	—
Manila	.60	●	—
Unbl. Toilet, 1 M.	3.20	●	—
Bleached Toilet	5.26	●	—
Paper Towels—			
Unbleached	1.80	●	—
Bleached	2.10	●	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	$8.25	@	$9.75
No. 2 Jute	7.50	@	9.00
No. 1 Manila Wrapping, 35 lb.	5.00	@	—
No. 2 Manila Wrapping, 35 lb.	4.75	@	—
Boards, per ton—			
News	$27.50	@	$30.00
Chip	27.50	@	30.00
Sgl. Mla. Ll. Chip.	42.50	@	—
Jute Lined Chip	42.50	@	45.00
White Pat. Coated	55.00	@	57.50
Kraft Liners	42.50	@	50.00
Binders Boards	71.00	@	77.00

The following are representative of distributors' resale prices:—

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1.	$39.10@$46.00	$40.25@$47.25
100% Rag	31.05@ 36.50	32.20@ 37.75
85% Rag		29.90@ 35.00
75% Rag	23.60@ 27.75	24.75@ 29.00
65% Rag		21.65@ 26.25
50% Rag	17.55@ 21.50	18.70@ 22.75
25% Rag	14.65@ 17.75	15.80@ 19.25

Colors at $1.00 cwt. extra

Sulphite Bonds and Ledgers—White, Assorted Items

Delivered in Zone 1

	Bonds	Ledgers
No. 1	$8.80@$10.75	$9.95@$12.00
No. 2	7.90@ 9.50	9.05@ 11.00
No. 4	7.00@ 8.50	8.20@ 10.00

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper

Delivered in Zone 1:

No. 1 Glossy Coated	$10.80	@$12.25
No. 2 Glossy Coated	9.25	@ 10.50
No. 3 Glossy Coated	8.15	@ 9.25
No. 4 Glossy Coated	7.65	@ 8.75
No. 1 Antique (watermarked)	7.65	@ 8.75
No. 2 Offset	7.00	@ 8.00
A Grade E. F.	6.80	@ 7.75
A Grade S. & S. C.	7.05	@ 8.00
B Grade E. F.	6.25	@ 7.25
B Grade S. & S. C.	6.50	@ 7.50
C Grade E. F.	6.00	@ 7.00
C Grade S. & S. C.	6.25	@ 7.25
D Grade E. F.	5.70	@ 6.75
D Grade S. & S. C.	5.95	@ 7.00

Ivory & India at $.50 cwt. extra.

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—		
Moist	25.00	@ 28.00
Dry	25.00	@ 28.00
(Delivered)		
No. 1 Domestic and Canadian	27.00	@ 30.00

Chemical Pulp

(On Dock, Atlantic, Gulf and W. Coast Ports)

Bleached Sulphite (Domestic and Foreign)—		
Prime Bleached Sulphite	2.40	@ 2.75
Prime Qualities—Easy-Bleaching Sulphite	1.95	@ 2.10
Strong Unbleached Sulphite	1.85	@ 2.00
(On Dock, Atlantic Ports)		
Kraft Bleached	2.75	@ 3.00
Kraft Light & Strong	1.90	@ 2.00
Kraft No. 1	1.75	@ 1.90
Kraft No. 2	1.50	@ 1.65
(F.o.b. Pulp Mill)		
Kraft Domestic	1.50	@ 1.90
(Delivered)		
Soda Bleached	2.55	@ —

Add 60 cents per short ton, discharges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—		
New White, No. 1.	6.75	@ 7.00
Silesias No. 1	4.00	@ 4.25
New Unbleached	6.75	@ 7.00
Blue Overall	5.50	@ 5.75
Fancy	2.10	@ 2.25
Washables	1.60	@ 1.70
Mixed Khaki Cuttings	3.25	@ 3.75
O. D. Khaki Cuttings	4.00	@ 4.25

Old Rags

White, No. 1—Repacked	3.15	@ 3.40
Miscellaneous	2.60	@ 2.75
White, No. 2—Repacked	2.10	@ 2.35
Miscellaneous	1.70	@ 1.80
Thirds and Blues—Repacked	1.40	@ 1.50
Miscellaneous	1.25	@ 1.30
Roofing Rags—		
No. 1	1.00	@ 1.10
No. 2	.80	@ .85
No. 3 (bagging)	.65	@ .70
No. 4	.65	@ .70
No. 5A	.65	@ .70

Foreign Rags

New Rags

New Dark Cuttings	2.25	@ 2.40
New Mixed Cuttings	2.00	@ 2.20
New Light Silesias	5.50	@ 5.75
Light Flannelettes	5.50	@ 5.75
New White Cuttings	7.00	@ 7.50
New Light Oxford	4.00	@ 4.50
New Light Prints	3.00	@ 3.25

Old Rags

No. 1 White Linens	7.50	@ 8.50
No. 2 White Linens	6.50	@ 7.50
No. 3 White Linens	4.50	@ —

REDWOOD PIPE LASTS LONG AND SAVES MONEY

It has 14% greater carrying capacity than metal pipe. Resists Frost where severe winters raise havoc with metal pipe. Does not fill up with vegetable matter nor corrode; does not Scale or Pit; is immune to Electrolysis; weighs about 1/3 as much as metal pipe and more easily installed. Wyckoff Redwood Pipe, made of all Clear Heart Stock Redwood Lumber, made in sizes of one inch and up, maximum lengths 12 feet, for pressure to 172 pounds, is used extensively for Water Supply Lines, Penstocks, Sewage Lines, Chemicals, Paper Mills, Tanneries, Fisheries, Mines, and Fume Stacks. We can furnish selected Canadian White Pine or Oregon Fir Wood Pipe if specified. We also manufacture underground Wooden Steam Pipe Covering. Carload shipments can be made one day after receipt order.

A. WYCKOFF & SON COMPANY *Office and Factory.* **65 Home Street, ELMIRA, N. Y.**

The Originators of Machine Made Wood Pipe

ALLIGATOR

TRADE MARK REG. U.S. PAT. OFFICE

STEEL BELT LACING

JUST A HAMMER TO APPLY IT
The compression grip protects belt ends.
Made with precision. Drives straight.
Smooth on both faces. Embeds in belt.
For all belts—all speeds. Flexible.
Rocker Hinge Pin. Separable joint.
Great strength. Long life.
"Never Lets Go"
REG. U. S. PAT. OFF.
ALLIGATOR
12 Sizes in Standard Boxes.

Made also in "Monel Metal" and non-magnetic alloy for special service, and in long lengths for wider belts.

Sole Manufacturers

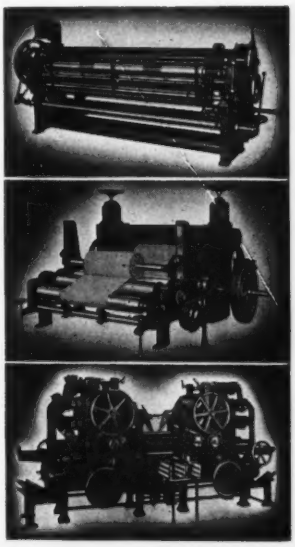
FLEXIBLE STEEL LACING CO.

4609 Lexington Street, Chicago, Illinois

In England 15 Westmoreland Place, London, N.1.

A LINE OF MACHINES . . . . YOU CAN ALWAYS DEPEND ON

Here are illustrated only three of our complete line of paper converting machines that include winders, embossers, crepers, printing presses, and die inkers, folders for napkins, tissue, towel, wax paper, facial tissue, and special machines to meet plant requirements. Complete details of any machine in which you may be interested are yours upon request.



PAPER CONVERTING MACHINE CO.

GREEN BAY, WISCONSIN

Manufacturers of paper converting machinery for all purposes.

FREDERICK Centrifugal PUMPS

CLOGLESS FOR HI-DENSITY STOCK

CENTRIFUGAL PUMPS FOR ALL PAPER MILL PURPOSES

ASH CONVEYORS——————STOKERS

THE FREDERICK IRON & STEEL CO.

FREDERICK, MARYLAND

No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	@	4.75
No. 2 White Cotton.	3.25	@	3.75
No. 3 White Cotton.	2.50	@	3.00
No. 4 White Cotton.	1.90	@	2.20
Extra Light Prints..	2.00	@	2.40
Ord. Light Prints...	1.75	@	2.15
Med. Light Prints...	1.55	@	1.95
Dutch Blue Cottons..	2.25	@	2.50
French Blue Linens..	3.00	@	—
Checks and Blues...	2.00	@	—
Linsey Garments....	1.90	@	2.00
Dark Cottons.....	1.50	@	1.60
Old Shopperies.....	1.30	@	1.45
New Shopperies.....	1.45	@	1.50
French Blues.....	2.25	@	2.50

Old Rope and Bagging

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.40	@	2.50
Domestic	2.25	@	2.35
Wool Tares, light...	1.80	@	1.90
Wool Tares, heavy...	1.90	@	2.00
Bright Bagging.....	1.70	@	1.80
Manila Rope—			
Foreign	2.50	@	2.75
Domestic	2.50	@	2.75
Jute Threads.....	2.75	@	3.00
Sisal Strings.....	1.50	@	1.60
Mixed Strings.....	.60	@	.70

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	2.65	@	2.70
Ordinary Hard White No. 1....	1.90	@	2.00
Soft White No. 1..	1.75	@	1.80
Soft White Extra..	2.25	@	2.40
Flat Stock—			
Stitchless	.80	@	.85
Overissue Mag.....	.70	@	.75
Solid Flat Book....	.60	@	.65
Crumbled No. 1...	.40	@	.45
Ledger Stock White.	1.35	@	1.40
Ledger Stock Colored	.80	@	.90
New B. B. Chips....	.15	@	.20
Manila—			
New Env. Cut.....	1.40	@	1.50
New Cuttings.....	1.25	@	1.35
Old Kraft Machine—			
Compressed bales..	.75	@	.80
News—			
No. 1 White News	1.35	@	1.40
Strictly Overissue..	.50	@	.55
Strictly Folded....	.35	@	.40
No. 1 Mixed Paper..	.15	&	.20

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.11	@	.13
White Hemp.....	.12	@	.14
Fine Polished—			
Fine India.....	.15	@	.17
Unpolished—			
Box	.08½	@	—
Paper Makers.....	.07½	@	.08½
Tube Rope.....	.09	@	.10
Wall Paper.....	.10	@	.11
Wrapping	.11	@	.13
Soft Fiber Rope...	.09½	@	.11½
Cotton	.15	@	.20

(Hard Fiber)

Medium Java.....	.09	@	.10
Mex. Sisal.....	.08½	@	.09½
Manila	.18	@	.25
Domestic	2.25	@	2.50
Sisal Rope.....	1.65	@	1.85
Mixed Rope.....	.50	@	.75
Transmission Rope ..	1.75	@	1.90
Soft Jute Ropes.....	1.85	@	2.00
Jute Carpet Threads..	.75	@	.90
Gunny Bagging—			
Foreign	2.37½	@	2.40
Domestic	2.00	@	—
Bleachery Burlap....	3.25	@	3.62½
Scrap Burlap—			
Foreign	1.50	@	1.60
Domestic	1.35	@	1.40
Scrap Sisal	1.25	@	1.50
Scrap Sisal for Shredding	1.75	@	1.90
Wool Tares, Heavy..	1.50	@	1.60
New Burlap Cuttings	1.75	@	2.00
Aust. Wool Pouches.	2.75	@	3.10
Heavy baling bagging	2.00	@	—
Paper Mill Bagging..	1.00	@	1.15
No. 2 Bagging.....	.60	@	.70

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints...	.03¼	@	.03½
New White No. 1...	.06¾	@	.07
New Light Flannelettes	.04¼	@	.04¾
Silesias No. 1.....	.04¼	@	.04¾
New Black Silesias..	.03¾	@	.04
Silesias No. 1 Soft Unbleached.....	.06¼	@	.06¾
Blue Cheviots.....	.05	@	.05¼
Fancy	.03	@	.03¼
Washable	.02¾	@	.03
Cottons—According to grades—			
Blue Overalls.....	.04¾	@	.05
New Black, soft...	.03¾	@	.04
Khaki Cuttings....	.03¾	@	.04¼
D. D. Khaki.....	.04	@	.04¾
Corduroy	.02¾	@	.03
New Canvas.....	.06¾	@	.07¼
B.V.D. Cuttings.....	—	@	.06¾

Domestic Rags (Old)

(F. o. b. Boston)

Canvas	.04½	@	—
White No. 1—			
Repacked	—	@	2.75
Miscellaneous	2.50	@	2.75
White No. 2—			
Repacked	1.90	@	2.00
Miscellaneous	2.00	@	2.25
Twos and Blues.....	1.75	@	2.00
Old Blue Overalls...	1.50	@	—
Third and Blues—			
Repacked	1.37½	@	1.75
Miscellaneous	1.25	@	1.43¾
Black Stockings.....	3.90	@	4.00
Roofing Stock—			
No. 1.....	1.00	@	1.10
No. 2.....	.75	@	.85
No. 3.....	.65	@	.70

Foreign Rags

(F. o. b. Boston)

Dark Cottons	1.05	@	1.15
Dutch Blues.....	2.65	@	2.75
New Checks and Blues	2.85	@	3.00
Old Fustians.....	2.25	@	2.50
Old Linsey Garments	2.20	@	2.25
New Silesias.....	6.00	@	6.50

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f. o. b. Phila.)

Shirt Cuttings—			
New White, No. 1.	.06	@	.06¼
New White, No. 2.	.03½	@	.04
Light Silesias.....	.03½	@	.04
Silesias, No. 1....	—	@	.04½
Black Silesias, soft.	—	@	.03
New Unbleached..	.05½	@	.06
Washable, No. 1..	.01½	@	.01¾
Blue Overall.....	.04	@	.04½
Cottons—According to grades—			
Washable No. 2...	.01	@	.01¼
New Blue.....	.01	@	.01¼
Fancy Percales....	—	@	.02½
New Black Soft...	.03	@	.03½
New Light Seconds	—	@	.04½
New Dark Seconds	.50	@	.75
Khaki Cuttings—			
No. 1 O. D.....	.03	@	.03½
No. 2 Mixed.....	.02	@	.02½
Corduroy	—	@	.02
New Canvas.....	.05	@	.05½
New Black Mixed.	.02½	@	.02¾

Domestic Rags (Old)

White No. 1—			
Repacked	3.00	@	3.25
Miscellaneous	2.50	@	2.75
Thirds and Blues—			
Miscellaneous	1.00	@	1.25
Repacked	1.50	@	1.75
Black Stockings (Export)	3.00	@	3.50
Roofing Stock—			
Foreign No. 1....	—	@	.95
Domestic No. 1....	—	@	.95
Domestic No. 2....	—	@	.85
Roofing Bagging..	—	@	.60

Bagging

(F. o. b. Phila.)

Gunny No. 1—			
Foreign	1.75	@	2.00
Domestic	1.50	@	1.75
Manila Rope.....	2.75	@	3.00
Sisal Rope.....	1.50	@	1.75
Mixed Rope.....	.75	@	1.00
Scrap—			
No. 1.....	—	@	1.50
No. 2.....	1.00	@	1.25
Wool Tares, heavy..	3.25	@	3.50
Mixed Strings.....	.75	@	1.00
No 1 New Light Burlap	2.50	@	3.00
New Burlap Cuttings	1.75	@	2.00

Old Papers

(F. o. b. Phila.)

Shavings—			
No. 1 Hard White.	2.25	@	2.30
No. 2 Hard White.	1.90	@	2.00
No. 1 Soft White..	1.65	@	1.80
No. 2 Soft White..	1.30	@	1.40
No. 1 Mixed.....	.65	@	.75
Solid Ledger Stock..	1.15	@	1.25
Ledger Stock, white.	1.15	@	1.25
Ledger Stock, colored	.62½	@	.80
No. 1 Books, heavy..	.50	@	.72½
Manila Cuttings....	1.50	@	1.75
Print Manila.....	.25	@	.35
Container Manila....	.20	@	.30
Kraft Paper.....	.60	@	.75
No. 1 Mixed Paper..	.20	@	.25
Straw Board Chip...	.25	@	.30
Binders Board Chip.	.25	@	.30
Corrugated Board...	.50	@	.55
Overissue News.....	.35	@	.45
Old Newspapers.....	.30	@	.35

BOSTON

Old Papers

(F. o. b. Boston)

Shavings—			
No. 1 Hard White	2.25	@	2.50
No. 1 Soft White..	1.85	@	2.15
No. 2 Mixed.....	.75	@	.80
Solid Ledger Books..	1.50	@	1.75
Overissue Ledger Stock	1.30	@	1.50
Mixed Ledgers.....	.85	@	.90
No. 1 Books, heavy..	.65	@	.75
No. 1 Books, light...	.65	@	.75
Crumpled Stitchless Book Stock.....	.55	@	.65
Manila Env. Cuttings	1.60	@	1.70
Manila Envelope Cuttings, extra quality.	2.00	@	2.10
No. 1 Old Manila...	.95	@	1.00
White Blank News..	1.30	@	1.40
No. 1 Kraft.....	.90	@	1.00
Mixed Papers.....	.15	@	—
Print Manila.....	.45	@	.55
Container Manilas...	.27½	@	—
Old Newspapers.....	.25	@	.32½
Paper Wool Strings..	.80	@	—
Overissue News.....	.45	@	.50
Box Board Chips....	.20	@	.25
Corrugated Boxes...	.30	@	.32½
Kraft corrugated boxes	.65	@	.70
Screening Wrappers..	.40	@	.45

Bagging

(F. o. b. Boston)

Manila Rope—			
Foreign	2.75	@	2.80

CHICAGO

Old Papers

(F. o. b. Chicago)

Shavings—			
No. 1 White Envelope Cuttings....	1.80	@	1.90
No. 1 Hard White.	1.70	@	1.80
No. 1 Soft White..	1.50	@	—
Ledger & Writings..	.75	@	.80
Solid Books.....	.55	@	—
Blanks	.90	@	—
Krafts	.60	@	—
New Kraft Cuts.....	1.10	@	—
Manila Env. Cuts...	Nominal		
Ex. No. 1 Manila...	Nominal		
Print Manila.....	Nominal		
Overissue News.....	.35	@	—
Old Newspapers—			
No. 1 Folded News	.30	@	—
No. 1 Mixed Paper	.20	@	—
Roofing Stocks—			
No. 1.....	2.00	@	2.10
No. 2.....	1.85	@	1.90

TORONTO

Paper

Bonds and Ledgers

Delivered

No. 1 White	.36½	@	—
No. 1 Tints	.37½	@	—
No. 2 White	.26½	@	—
No. 2 Tints	.27½	@	—
No. 4 White	—	@	.1550
No. 4 Tints 16.50		@	—
No. 5 Bond—White 11.85		@	—
No. 5 Bond—Tints .12.85		@	—
No. 5 Bond—Golden Rod 13.35		@	—
No. 5 Ledger—White .1185		@	—
No. 5 Ledger—Tints. .1285		@	—
No. 6 Bond—White .10.75		@	—
No. 6 Bond—Tints .11.25		@	—
No. 6 Bond—Golden Rod 12.75		@	—
No. 7 Bond—White . 9.10		@	—
No. 7 Bond—Tints . 9.60		@	—
No. 7 Bond—Golden Rod 11.10		@	—
Book—			
No. 1 M. F. 7.35		@	—
No. 2 M. F. 6.85		@	—
No. 3 M. F. 5.60		@	—
No. 1 S. C. 7.60		@	—
No. 2 S. C. 7.10		@	—
No. 3 S. C. 6.10		@	6.35
No. 1 Coated Book and Litho 12.50		@	—
No. 2 Coated Book and Litho 11.00		@	—
No. 3 Coated Book and Litho 10.00		@	—
Coated tinted.....13.50		@	—
Wrapping—delivered—			
Rag Brown.....	4.85	@	5.35
White Wrap.....	4.00	@	—
"B" Manila.....	4.90	@	6.25
No. 1 Manila.....	5.50	@	7.00
Fiber	5.50	@	—
Kraft No. 2.....	5.50	@	—

(F. o. b. Cars, Toronto)

News per ton—			
Rolls (contract)..$50.00		@	—
Sheets 69.50		@	—

Pulp

Ground wood.....29.00		@	—
Unbleached Sulphite..49.00		@	—
Book (Class 1).....59.00		@	—
Writing (Class 2)...57.00		@	—
Select (Class 3).....58.00		@	—
Kraft 50.00		@	—
Soda 54.00		@	56.00

Old Waste Paper

(In carload lots, f. o. b. Toronto)

Shavings—			
White Env. Cut...	2.25	@	—
Soft White.....	2.15	@	—
White Blk. News..	1.25	@	—
Book and Ledger—			
Flat Magazine and Book Stock (old)	.80	@	—
Light and Crumpled Book Stock.	.70	@	—
Ledgers and Writings	1.10	@	—
Manilas—			
New Manila Cut...	1.35	@	—
Printed Manilas...	.45	@	—
Kraft	.95	@	—
News and Scrap—			
Strictly Overissue.	.50	@	—
Strictly Folded....	.45	@	—
No. 1 Mixed Paper..	.30	@	—

Domestic Rags

(Price to mills, f. o. b. Toronto)

No. 1 White Shirt Cuttings	.06½	@	.06¾
Fancy Shirt Cuttings	.02½	@	.03¼